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Intraoperative Coagulopathy: A Low-Volume Treatment Protocol that Completely Replaces Fresh Frozen Plasma

Peter Kallas, MD[1]; Mary Lou Green, MHS[2]; and Anjali Desai, MD[1]
[1]Northwestern University, Chicago, IL; [2]Northwestern Memorial Hospital, Chicago, IL

Background: Fresh frozen plasma (FFP) is commonly used to correct intraoperative coagulopathies (believed to be secondary to clotting factor depletion, platelet consumption, and/or volume replacement strategies), but is associated with significant fluid volume if multiple units are given. Similar to other institutions, volume overload and a high number of ventilator days were major issues in high-risk spine surgeries (HRSS) at our institution.

Methods: As part of a quality improvement (QI) initiative addressing the entire perioperative period, we evaluated use of a low-volume approach to treat coagulopathies—sequential use of cryoprecipitate, DDAVP, and activated factor VII (fVIIa) instead of FFP. Our goals were to reduce blood loss, reduce overall intraoperative fluid volume, and reduce postoperative ventilator days. Following implementation of the intervention, we retrospectively reviewed the charts of 16 consecutive patients who underwent HRSS (defined as greater than 5 levels of fusion or lasting at least 360 minutes) and 16 patients who underwent HRSS after protocol intervention. The protocol was implemented in January 2007. Sixteen consecutive patients were chosen in a blind fashion between October and November 2005 (preprotocol) and May and June 2007 (postprotocol implementation).

Results: The protocol patients as a group had an 18% (20-unit) reduction in packed red blood cell (pRBC) units (P = .52), a 15% (17.1 L) reduction in crystalloid (P = .35), and a 24% (5.3 L) increase in colloid usage (P = .65). The preprotocol patients used 88 units (22 L) of FFP as opposed to none in the protocol patients. Per patient, the protocol cohort received 2.7 L less volume, had a 2.3-day (14%) reduction in length of stay (LOS) (P = .52), and had a 1.1-day (9%) reduction in ventilator days (P = .91). The surgeries using the protocol lasted on average 19 minutes less, had more women (75% vs 56%), more 2-stage surgeries (6 vs 3), more revisions (9 vs 4), and more osteotomies (38 vs 25). The preprotocol cohort had more lumbar levels (71 vs 64), but the protocol cohort had more cervicothoracic levels (78 vs 61).

Of note, the deep vein thrombosis (DVT) rate doubled from 12.5% to 25% after the protocol was implemented. Also, fVIIa was given to only 1 patient during the study and this patient did not acquire a DVT.

Conclusion: Using an innovative low-volume coagulopathy treatment protocol, we successfully reduced intraoperative blood product usage and overall resuscitative volume, ventilator days, and LOS in 16 patients undergoing HRSS. However, the rate of DVT development doubled. Prior to implementing this low-volume coagulopathy treatment protocol, the impact of the increased risk of postoperative DVT needs to be assessed.