Rotational thromboelastometry in spine surgery

In major spine surgery, Rotational thromboelastometry ROTEM-guided transfusion allows for standardization of transfusion practices and early identification and treatment of hypofibrinogenemia. Hypofibrinogenemia is an important cause of the coagulopathy encountered during these procedures and aggressive management of this complication is associated with less intraoperative blood loss, reduced transfusion requirements, and decreased transfusion-related cost [1)].

The objective of a study was to investigate the effect of ROTEM-guided blood product management on perioperative blood loss and transfusion requirements in adult spinal deformity (ASD) patients undergoing correction with pedicle subtraction osteotomy (PSO).

Buell et al., retrospectively reviewed patients with ASD who underwent single-level lumbar PSO at the University of Virginia Health System. All patients who received ROTEM-guided blood product transfusion between 2015 and 2017 were matched in a 1:1 ratio to a historical cohort treated using conventional laboratory testing (control group). Co-primary outcomes were intraoperative estimated blood loss (EBL) and total blood product transfusion volume. Secondary outcomes were perioperative transfusion requirements and postoperative subfascial drain output.RESULTSThe matched groups (ROTEM and control) comprised 17 patients each. Comparison of matched group baseline characteristics demonstrated differences in female sex and total intraoperative dose of intravenous tranexamic acid (TXA). Although EBL was comparable between ROTEM versus control (3200.00 ± 2106.24 ml vs 3874.12 ± 2224.22 ml, p = 0.36), there was a small to medium effect size (Cohen's d = 0.31) on EBL reduction with ROTEM. The ROTEM group had less total blood product transfusion volume (1624.18 ± 1774.79 ml vs 2810.88 ± 1847.46 ml, p = 0.02), and the effect size was medium to large (Cohen's d = 0.66). This difference was no longer significant after adjusting for TXA (β = -0.18, 95% confidence interval [CI] -1995.78 to 671.64, p = 0.32). More cryoprecipitate and less fresh frozen plasma (FFP) were transfused in the ROTEM group patients (cryoprecipitate units: 1.24 ± 1.20 vs 0.53 ± 1.01, p = 0.03; FFP volume: 119.76 ± 230.82 ml vs 673.06 ± 627.08 ml, p < 0.01), and this remained significant after adjusting for TXA (cryoprecipitate units: β = 0.39, 95% CI 0.05 to 1.73, p = 0.04; FFP volume: β = -0.41, 95% CI -772.55 to -76.30, p = 0.02). Drain output was lower in the ROTEM group and remained significant after adjusting for TXA.CONCLUSIONSFor ASD patients treated using lumbar PSO, more cryoprecipitate and less FFP were transfused in the ROTEM group compared to the control group. These preliminary findings suggest ROTEM-guided therapy may allow early identification of hypofibrinogenemia, and aggressive management of this may reduce blood loss and total blood product transfusion volume. Additional prospective studies of larger cohorts are warranted to identify the appropriate subset of ASD patients who may benefit from intraoperative ROTEM analysis [2)].

Guan et al.,investigated whether the use of ROTEM reduces transfusion requirements in a case-control study of thoracolumbar deformity surgery.

Data were prospectively collected on all patients who received ROTEM-guided blood product management during long-segment (≥ 7 levels) posterior thoracolumbar fusion procedures at a single

institution from April 2015 to February 2016. Patients were matched with a group of historical controls who did not receive ROTEM-guided therapy according to age, fusion segments, number of osteotomies, and number of interbody fusion levels. Demographic, intraoperative, and postoperative transfusion requirements were collected on all patients. Univariate analysis of ROTEM status and multiple linear regression analysis of the factors associated with total in-hospital transfusion volume were performed, with $p < 0.05$ considered to indicate statistical significance.

Fifteen patients who received ROTEM-guided therapy were identified and matched with 15 non-ROTEM controls. The mean number of fusion levels was 11 among all patients, with no significant differences between groups in terms of fusion levels, osteotomy levels, interbody fusion levels, or other demographic factors. Patients in the non-ROTEM group required significantly more total blood products during their hospitalization than patients in the ROTEM group (8.5 ± 4.2 units vs 3.71 ± 2.8 units; $p = 0.001$). Multiple linear regression analysis showed that the use of ROTEM ($p = 0.016$) and a lower number of fused levels ($p = 0.022$) were associated with lower in-hospital transfusion volumes.

ROTEM use during thoracolumbar deformity correction is associated with lower transfusion requirements. Further investigation will better define the role of ROTEM in transfusion during deformity surgery [3].

SEER sonorheometry demonstrates very strong correlation with ROTEM for determining clot stiffness and assessing fibrinogen and platelet contribution to clot strength in major spine surgery. An advantage of SEER sonorheometry is direct measurement of clot elasticity with no need to transform amplitude oscillation to elasticity [4].

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