Earlier detection of coagulopathy during paediatric cardiac surgery

Birgitta Romlin, Håkan Wåhlander, Mats Synnergren, Anders Jeppsson, *Institute of Medicine, Sahlgrenska Academy, Gothenburg, Sweden*

Introduction

Cardiac surgery with cardiopulmonary bypass (CPB) induces a coagulopathy, which may lead to bleeding complications. Early detection of the coagulopathy increases the possibility to initiate countermeasures. The coagulopathy can be detected with thromboelastography/metry (TEG/TEM) and the use of intraoperative TEG/TEM has been demonstrated to reduce transfusion requirements in both adult and paediatric surgery. The aims of the present study were to investigate 1. If hemodilution influences intraoperative TEM results and 2. If analysis of clot firmness already after 10 minutes gives reliable results.

Methods

Fifty-six paediatric cardiac surgery patients (median age 5.8 months, median weight 5.8 kg) were included in a prospective observational study. TEM with HEPTEM clotting time (CT), clot formation time (CFT), clot firmness after 10 minutes (A10) and at maximum (MCF), and FIBTEM clot firmness after 10 minutes and at maximum were analysed at the end of CPB (after rewarming) and after modified ultrafiltration (after weaning from bypass). Analyses before and after ultrafiltration, and between A10 and MCF were compared and the differences calculated.

Results

Modified ultrafiltration increased hematocrit from 28±3 to 37±4 %, $p<0.001$. Only CT (-29s (95% confidence interval -29 to -2), $p=0.036$) and MCF (-1.5 mm (-2.9 to -0.1), $p=0.038$) differed significantly before and after ultrafiltration. A10 measurements were significantly lower than MCF both for HEPTEM and FIBTEM ($p<0.001$ both). However, the correlation between A10 and MCF was significant ($r=0.96$, $p<0.001$) and the differences were highly predictable with narrow confidence intervals (HEPTEM -8.2 mm (-8.9 to -7.5) and FIBTEM -0.5 mm (-0.7 to -0.3).

Conclusion

Hemodilution has no or limited effect on TEM results. Measurement of clot firmness after 10 minutes is highly predictable for maximum clot firmness. The results suggest thus that intraoperative TEM analyses can be accelerated 1. By analysing HEPTEM/FIBTEM during CPB and 2. By analysing clot firmness already after 10 minutes.

References

1. Joshua W. Salvin, Mark A. Scheurer, Peter C.Laussen, David Wypij, Angelo Polito, Emile A.Bacha, Frank A.Pigula, Francis X.McGowan, JohnM.Costello and Ravi R.Thiagarajan.
2. Blood transfusion after paediatric cardiac surgery is associated with prolonged hospital stay. Ann Thorac Surg 2011;91:204-10
3. Osthaus W. Boethig D. Whole blood coagulation measured by modified thrombelastography (ROTEM) is impaired in infants with congenital heart disease: Blood Coagulation and Fibrinolysis 2008;19:220-225
4. Lesserson L. Manspeizer H. Thromboelastography-guided transfusion algorithms reduces transfusions in complex cardiac surgery. Anesth Analg 1999;88:312