Performance assessment of unfractionated heparin protocol in pediatric patients supported on extracorporeal membrane oxygenation

E. Shorog1, A. Aljazairi2, R. Aljasser2, T. Owaidah2, R. Al-Mehizia2, H. Adalaty2, S. Alhashim2

1King Faisal Specialist Hospital and Research Centre, King Khalid University, Riyadh, Abha, Saudi Arabia; 2King Faisal Specialist Hospital & Research Centre, Pharmaceutical care division, Riyadh, Saudi Arabia

Funding Acknowledgement: Type of funding sources: None.

Background: Using extracorporeal membrane oxygenation in critical care setting is evolving. Unfractionated heparin is the most commonly used anticoagulant and a well-designed protocol is needed. However, there is no consensus from any organization regarding standard protocol. We developed UFH protocol taking into consideration best available evidence and anecdotal ECMO data. This study aims to assess ability of current protocol to achieve anti-Xa assay therapeutic target.

Methods: Prospective cohort, single-arm study conducted in Pediatric Cardiac Surgery Intensive Care Unit. Twenty patients were required. Anti-Xa assay therapeutic range is 0.1–0.3 U/mL for bleeding and 0.3–0.7 U/mL for non-bleeding patients. The protocol was developed after comprehensive literature review and continuous strict review process by a multidisciplinary ECMO team. It identifies initial UFH infusion dosing and subsequent adjustment, frequency of monitoring Anti-Xa assay, and other laboratory parameters. To ensure protocol adherence, teaching sessions were provided. Finally, we explored survival to discharge rate. The study was approved by the Office of Research Affairs with verbal consent.

Results: Twenty patients were included, half of them were female. Mean age of 35 months ± SD 52.5 and mean weight of 5.7 kg ± SD 3.8–14.1. Mean estimated glomerular filtration rate using schwartz equation was 80 mL/min/1.73 m² ± SD 34.7. Main indications of ECMO use were failure to wean after surgery (45%). Median ECMO duration was 6 days+ (IQR: 4.5–7.5). Baseline Anti-Xa assay before cannulation was 0.1 IU/mL. Another important baseline laboratory value was antithrombin III, the mean was 21.1 ± SD 14.3. Selection of bleeding protocol is based on a set of criteria in the bleeding section (Appendix 1). Pre-cannulation heparin bolus of 50–100 units/kg was given if ACT is <300 seconds for 11 patients (55%). Holding unfractionated heparin was required in 8 patients (40). Median time UFH was on-hold 13.5 hours (IQR: 10.5–27.5). Achieving Anti-Xa assay therapeutic target thorough out study period was reported in 70% of patients. Median time to achieve target was 41 hours (IQR: 0–91.5) and maintained for 8 hours (IQR: 0–22). Hemorrhagic complications were reported in 8 patients (40%) while thrombotic complications in 5 patients (25%). Both peripheral cannulation site bleeding and gastrointestinal bleeding occurred in 5%. Surgical exploration was needed in 6 patients (30%). Median time to first replacement was 80.5 hours (IQR: 19.5–228.5). Median hospital length of stay was 37 + IQR: 43–22 with survival rate at discharge of 75%.

Conclusion: Implemented UFH protocol in pediatric ECMO failed to achieve target in early hours after cannulation. However, the majority of those critically ill patients achieved Anti-Xa assay target and maintained it after the third day until day ten. Thromboembolic, hemorrhagic complications, and survival rates were consistent with the reported data.