



Blood Product Administration is Not Associated with Unscheduled Filter Change in Pediatric Continuous Renal Replacement Therapy

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BACKGROUND

- Continuous renal replacement therapy (CRRT) is the modality of choice for critically ill children with acute kidney injury, fluid overload, electrolyte abnormalities and hyperammoninemia who require gentle fluid removal due to hemodynamic instability as well as clearance. CRRT is frequently used to allow for pediatric patients (pts) to receive adequate nutrition.
- CRRT filter loss secondary to clotting can lead to adverse outcomes such as inadequate dialysis delivery, inadequate nutrition, worsening fluid overload and inadequate metabolic control, as well as blood loss.
- In younger pediatric patients who require a blood prime due to the large extracorporeal volume, filter loss leads to an increased exposure to packed red blood cells (pRBCs).
- Factors that can lead to premature filter loss have been extensively studied in adults, but data is scarce in pediatric literature. Use of anticoagulation is crucial in prolonging filter life. Another cause of premature filter loss appears to be related to dialysis access; a problem that pediatric patients encounter frequently as they require smaller access sizes and lower blood flows.
- Critically ill pts typically require multiple blood products. Administration of procoagulant factors with fresh frozen plasma (FFP) and cryoprecipitate (cryo) and increased blood viscosity with pRBC transfusion could lead to increased filter clotting. Recently, an association was reported with FFP administration and filter loss in patients with liver failure on CRRT anticoagulated with either heparin or prostacyclin

HYPOTHESIS

- We hypothesized that there would be a correlation between blood product transfusions and unscheduled filter loss in CRRT pts receiving regional citrate anticoagulation (RCA)

METHODS

- Retrospective, single center cohort study
- All Pediatric CRRT patients treated over a period of 12 months (July 1, 2013 to July 30, 2014) were included
- Patients with liver failure as well as pts receiving modified CRRT through extracorporeal membrane oxygenator (ECMO) circuits were excluded
- All patients received continuous venovenous hemodiafiltration (CVVHDF) with prefilter hemodilution using RCA
- Minimum clearance prescribed was 2000 ml/1.73m²/h. Only HF1000 were used.
- Blood products included pRBCs, platelets, FFP, and cryoprecipitate
- The primary outcome was unscheduled CRRT filter loss within 2 hours of blood product administration

RESULTS

	All Patients (n=28)
Age, years	9.5 ± 6.4
Male	17
Diagnosis (n, %)	
Sepsis	4 (14.2)
Renal disease	4 (14.2)
Metabolic	4 (14.2)
BMT	4 (14.2)
Other	12 (42.8)
CRRT indication (n, %)	
AKI	22 (78.5)
Hyperammoninemia	4 (14.2)
Drug toxicity	2 (7.1)
Weight at CRRT initiation, kg	35 ± 22.5
Access size (n, %)	
11.5F	14 (39.2)
10F	7 (25)
9F	2 (7.1)
8F	3(10.7)
7F	2 (7.1)
Access location (n, %)	
Internal jugular	13 (46.4)
Femoral	14 (50)
Subclavian	1 (3.6)
Blood prime (n, %)	11 (39)
Blood flow, ml/kg	4.5 ± 2.5
Thrombocytopenia at initiation (n, %)	19 (67.8)

Table 1. Demographics of the cohort including CRRT access properties and blood flow

- 28 pediatric patients had 124 filter changes over the study period.
- 87 filters (70%) were changed electively.
- Median filter life was 67.6 hours (IQR 37.7-75.5 hours).
- Two patients with known tenuous access had 17 and 7 filter losses due to access-related clotting, respectively.
- Pts received a total of 470 blood products while on CRRT.
- 15 blood products were given within the 2 hours preceding filter change
- Out of the 14 filters that had blood products given 2 hours preceding a filter change, only 2 were unscheduled due to filter clotting. (p=0.87)
- In both cases the products administered were platelets.

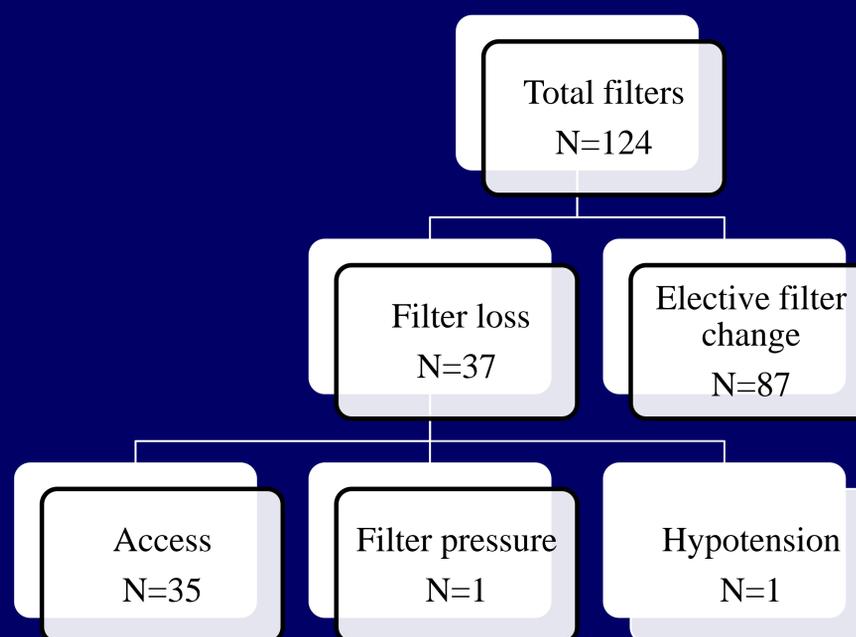


Figure 1. Breakdown of filter change

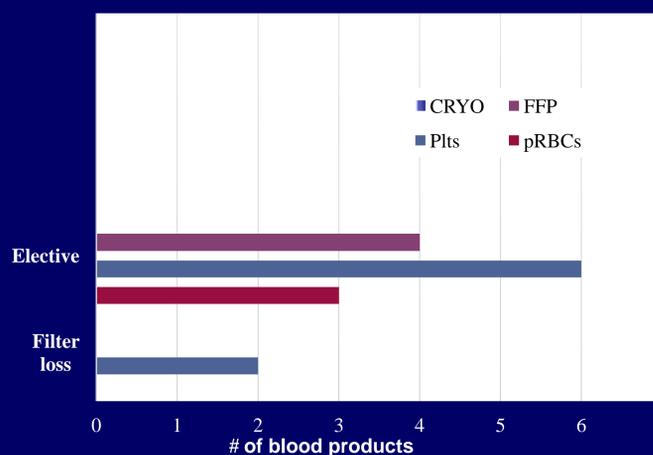


Figure 2. Type of blood products administered within 2 hours preceding a filter change

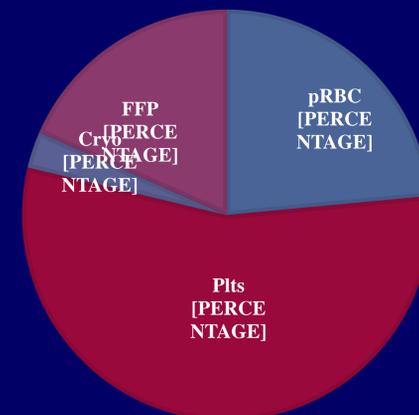


Figure 3. Breakdown of all blood products administered

Conclusion

- Blood product administration appears not associated with filter loss in pediatric CRRT pts on RCA (p=0.87)
- 2 episodes of filter loss were observed with platelets administered within 2 hours preceding event. Both episodes occurred in 1 patient with documentation of problems with her access at the time of filter loss.
- Despite the number of blood products administered, our median filter life was longer than what has been reported.
- Access problems were most commonly observed in association with filter loss.
- As it is important to minimize the amount of CRRT downtime in order to provide critically ill patients with adequate nutrition, dialysis delivery, and fluid management., more investigation is needed to identify other modifiable risk factors for filter loss to minimize treatment interruptions.