

Combining plasmapheresis and CRRT within the same circuit. Is it doable?

Pr. Thomas RIMMELE

Anesthesiology and Intensive Care Medicine

Pasteur university hospital

NICE, FRANCE

rimmele.t@chu-nice.fr



Athens, Greece
10th National Haemapheresis Association Conference
November 28th 2025



Conflicts of Interest

Scientific partnership with the following companies:

- Vantive
- BBraun
- Biomérieux
- Estor/Toray
- Exthera
- Fresenius Medical Care
- Infomed
- Jafron
- Cytosorbents
- Norrdia

Help from AI

*The percentage of ICU patients who get plasmapheresis varies significantly, but some studies show rates of **0.15% to 8%** in specific populations.*

The overall percentage is not a single fixed number, as it depends on the specific ICU, the patient population, and the time period studied. For example, one study found that out of 387 patients over a 10-year period in four ICUs, 8% received plasmapheresis, while another study identified a use incidence of just 0.15% in a single ICU.

Combining plasmapheresis and CRRT within the same circuit. Is it doable?

YES! But...

Outline

- 1) Nomenclature considerations regarding Tandem CRRT TPE
- 2) Technological aspects for Tandem CRRT TPE
- 3) What is the main benefit of Tandem CRRT TPE?
- 4) Is this benefit scientifically demonstrated in the literature?
- 5) What is the most important thing we have to pay attention to when a tandem CRRT TPE session is ongoing?

Outline

1) Nomenclature considerations regarding Tandem CRRT TPE

2) Technological aspects for Tandem CRRT TPE

3) What is the main benefit of Tandem CRRT TPE?

4) Is this benefit scientifically demonstrated in the literature?

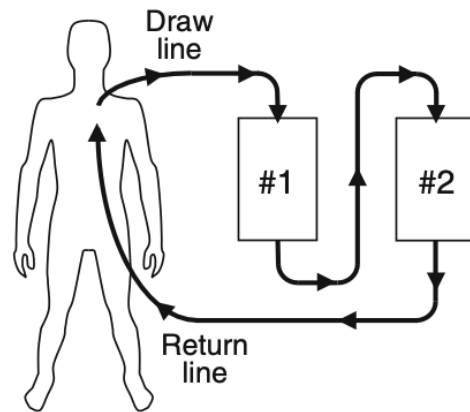
5) What is the most important thing we have to pay attention to when a tandem CRRT TPE session is ongoing?

When a critically ill patient requires both CRRT and plasmapheresis, options include:

- 1) Pause one therapy to perform the other (i.e. stop CRRT during TPE, then resume CRRT afterwards)
- 2) Perform the procedures simultaneously thanks to 2 separate vascular accesses
- 3) Perform the procedures simultaneously via A SINGLE ACCESS but a combined circuit, either in series or in parallel; = « TANDEM »

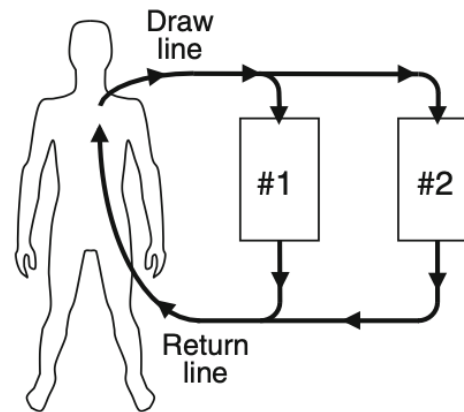
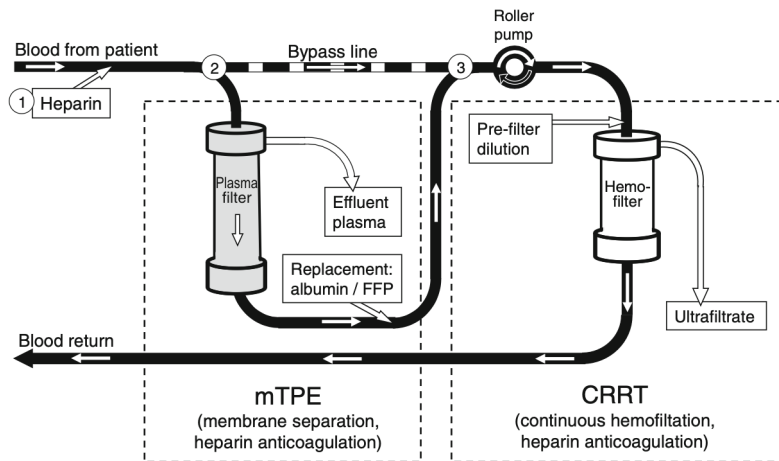
Circuits “In series” or “In parallel” ?

Definition of “In series” vs “In parallel”



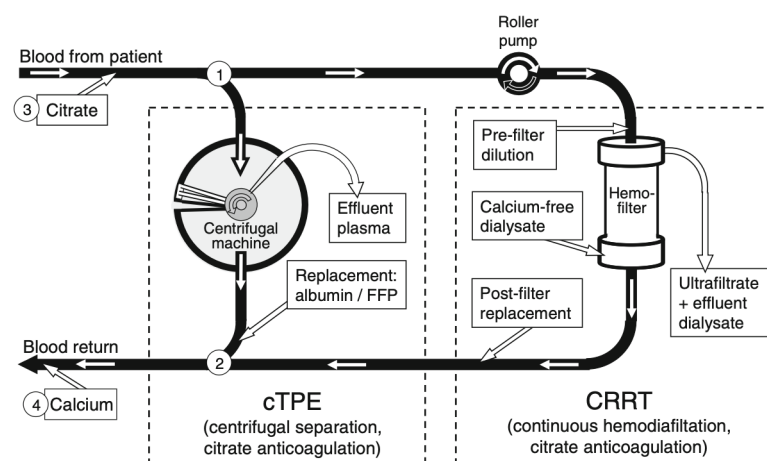
(A) In series

- Same blood flow for both systems

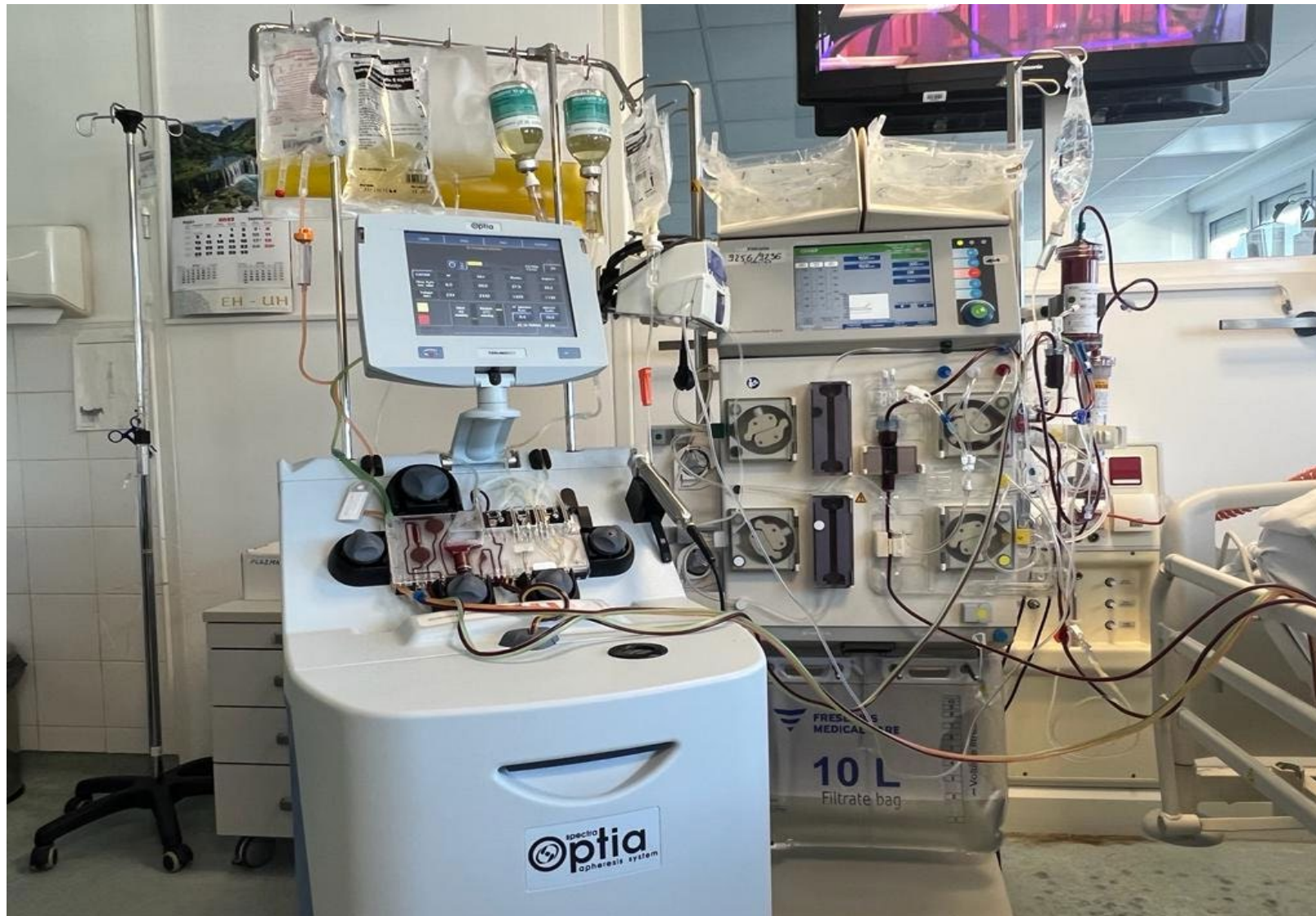


(B) In parallel

- Different blood flows between system 1 and system 2



Centrifugal plasma exchange in series with CRRT



Outline

1) Nomenclature considerations regarding Tandem CRRT TPE

2) **Technological aspects for Tandem CRRT TPE**

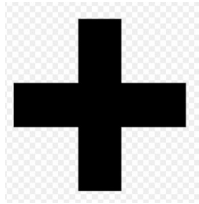
3) What is the main benefit of Tandem CRRT TPE?

4) Is this benefit scientifically demonstrated in the literature?

5) What is the most important thing we have to pay attention to when a tandem CRRT TPE session is ongoing?

2 machines: a TPE machine AND a CRRT machine!

Membrane-based TPE machine + CRRT machine



©INFOMED

Centrifugal TPE machine + CRRT machine



The Y-piece connectors

Received: 9 December 2021 | Revised: 31 January 2022 | Accepted: 24 March 2022
DOI: 10.1002/jca.21984

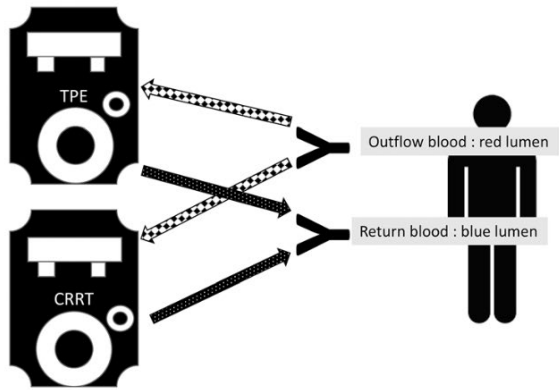
BRIEF REPORT

Therapeutic plasma exchange in the intensive care unit and with the critically ill, a focus on clinical nursing considerations

Ian Baldwin  | Sarah Todd



(A) Two therapies concurrent : Y adaptors to access catheter.



(B)

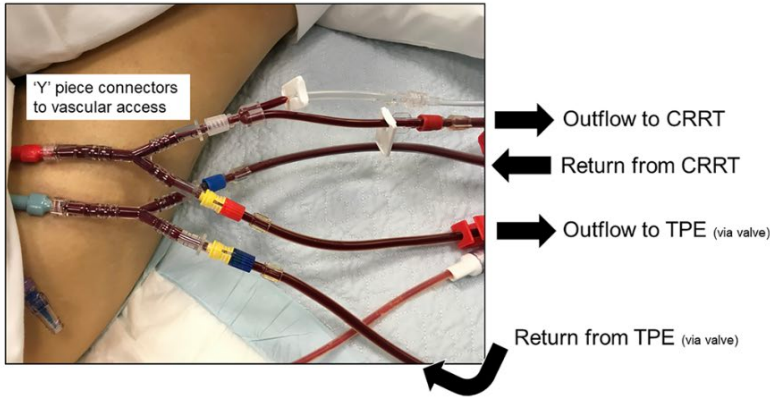


FIGURE 2 (A) 'Y' piece connectors for two circuits and machines. TPE and CRRT concurrent. (B) Pictured with valves in place

1/ The « in parallel » set up

2 Y-piece connectors are necessary

Advantages:

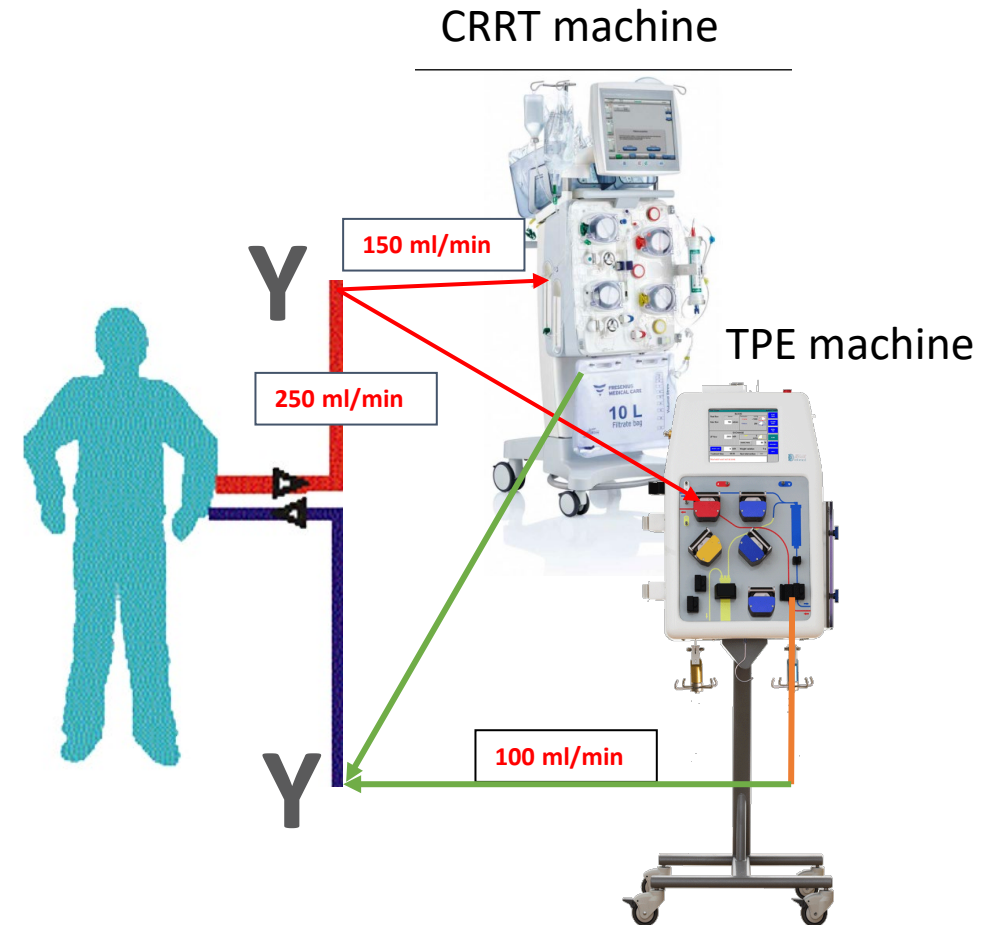
- The 2 machines are independent from each other

Disadvantages:

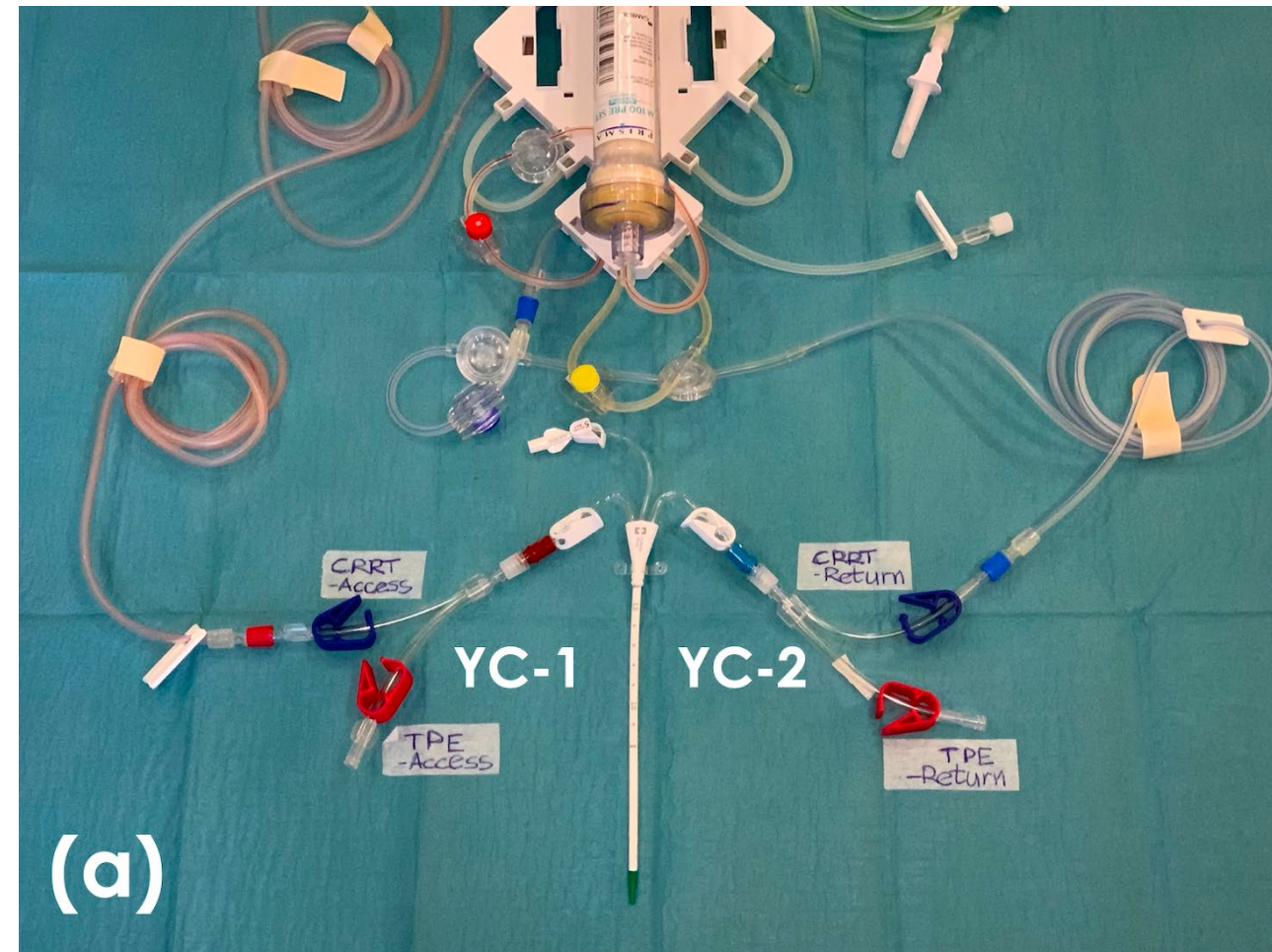
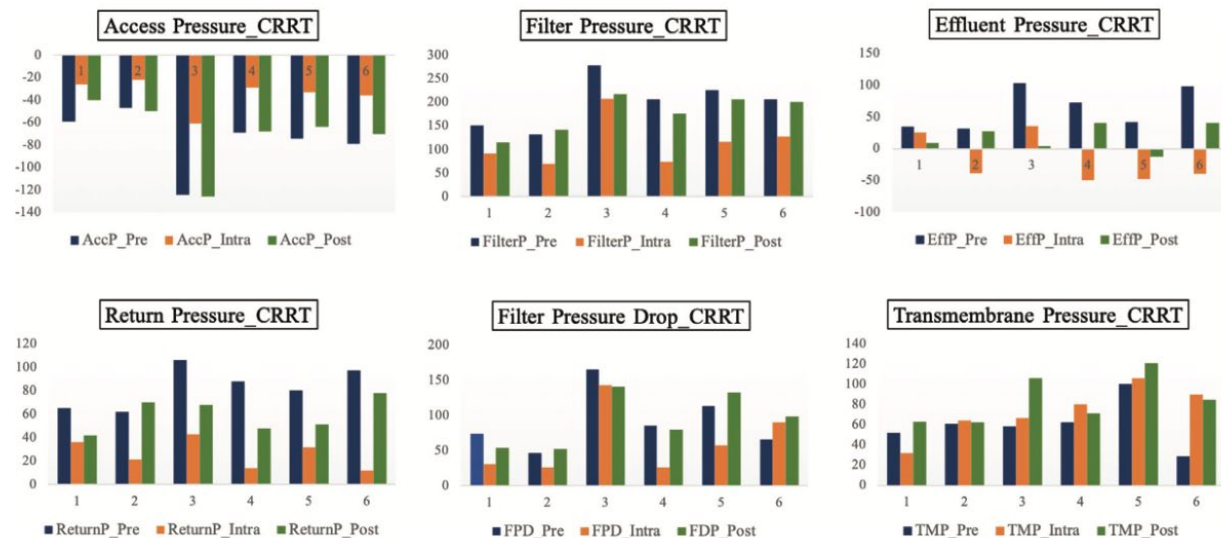
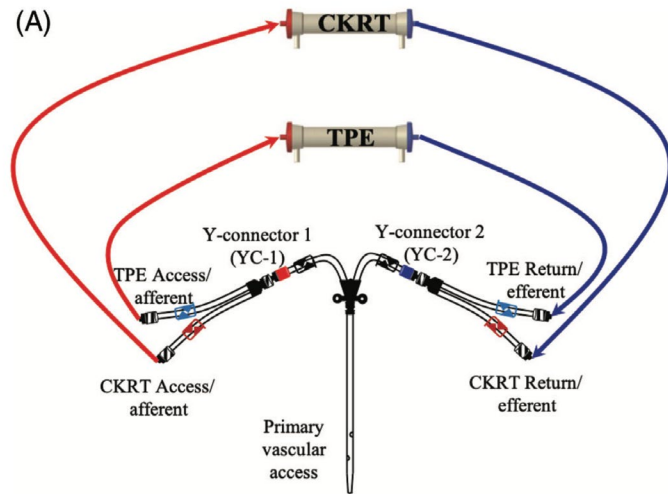
- Two independent anticoagulation protocols
- CRRT Blood flow can be limited by the TPE blood flow

Consequence:

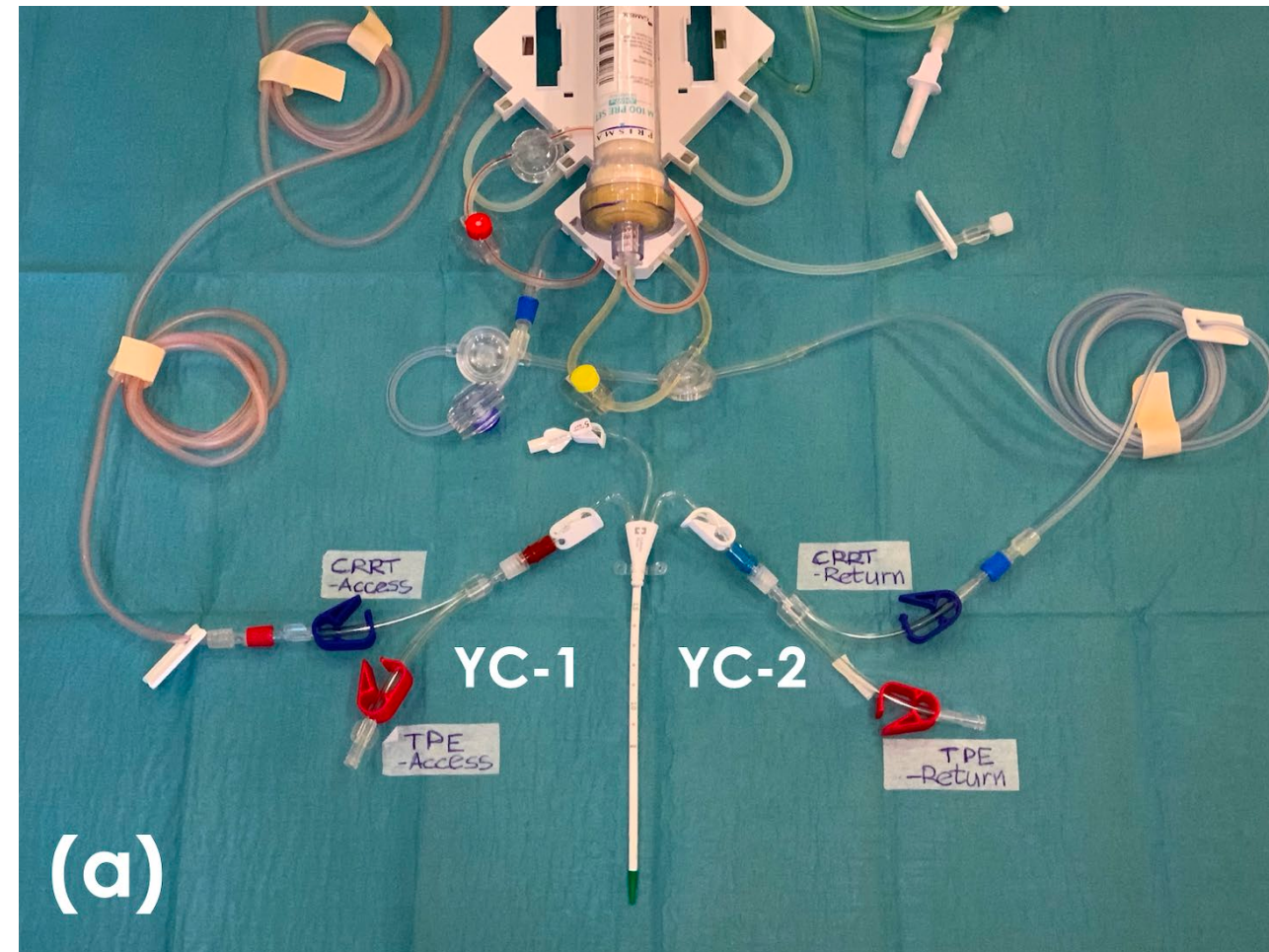
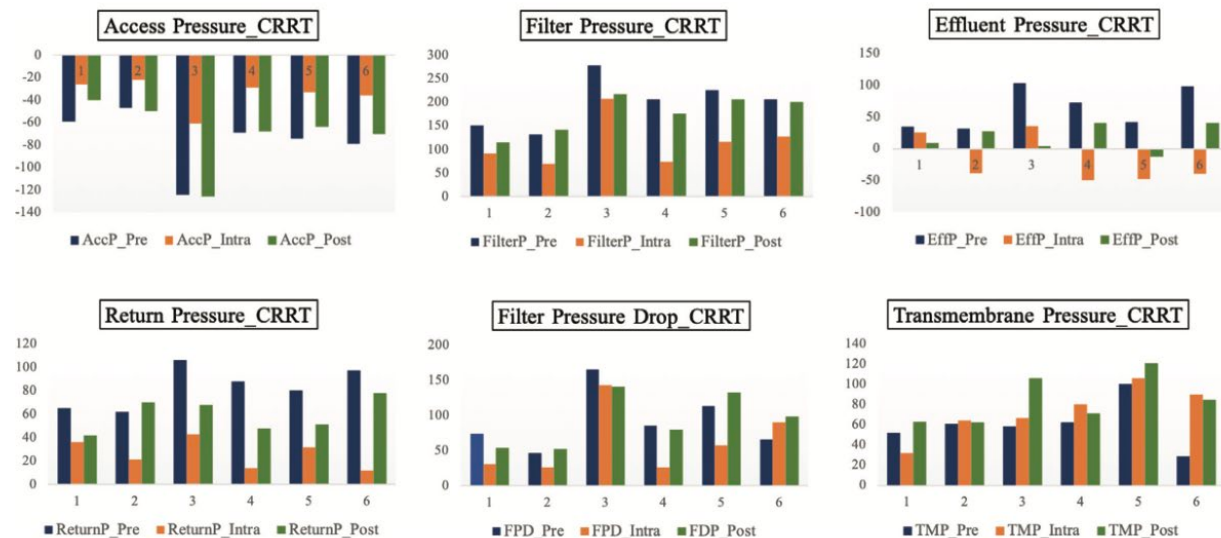
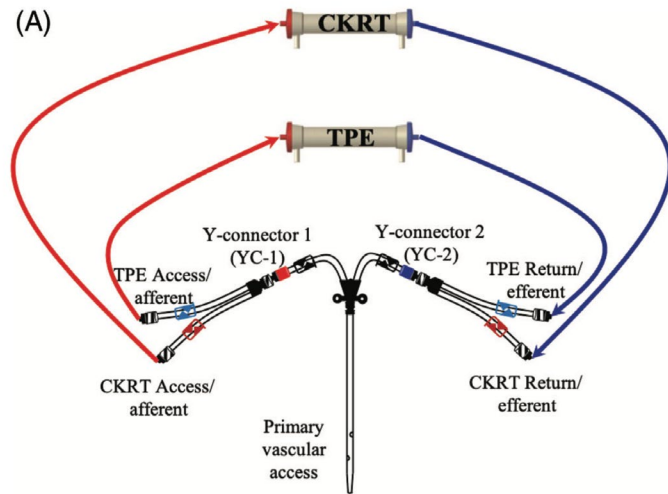
CVVHD may be the most doable modality with this setting (CRRT Modality for which a low blood flow rate is acceptable)



Concurrent “CKRT” with TPE: Parallel connection



Concurrent CRRT with TPE: Parallel connection



2/ The « in series » set up

One system first, followed by the second one. The return line of the CRRT machine is actually also the entry line of the TPE machine.

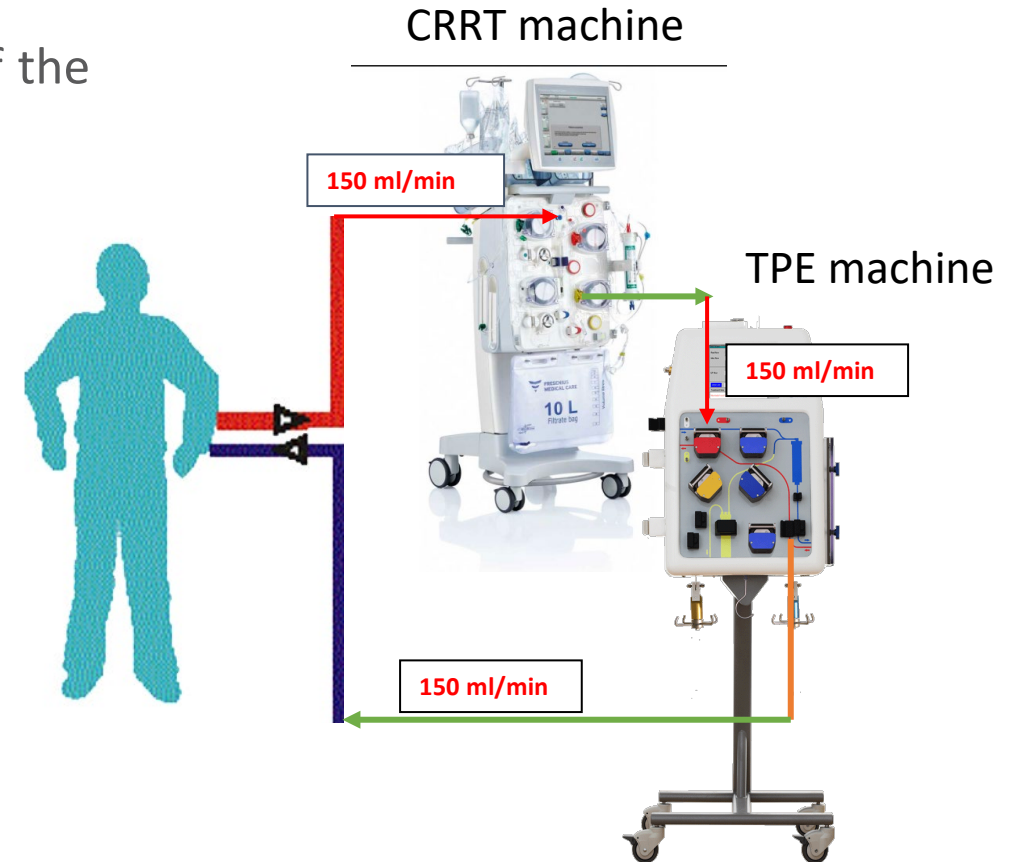
Advantages:

- One single anticoagulation

Disadvantages:

- Blood flow rate is the same everywhere within the circuit
- The 2 machines are strongly inter-related ++++
- When there is one alarm on one machine, usually alarm on the second machine

No Y-piece connector needed here

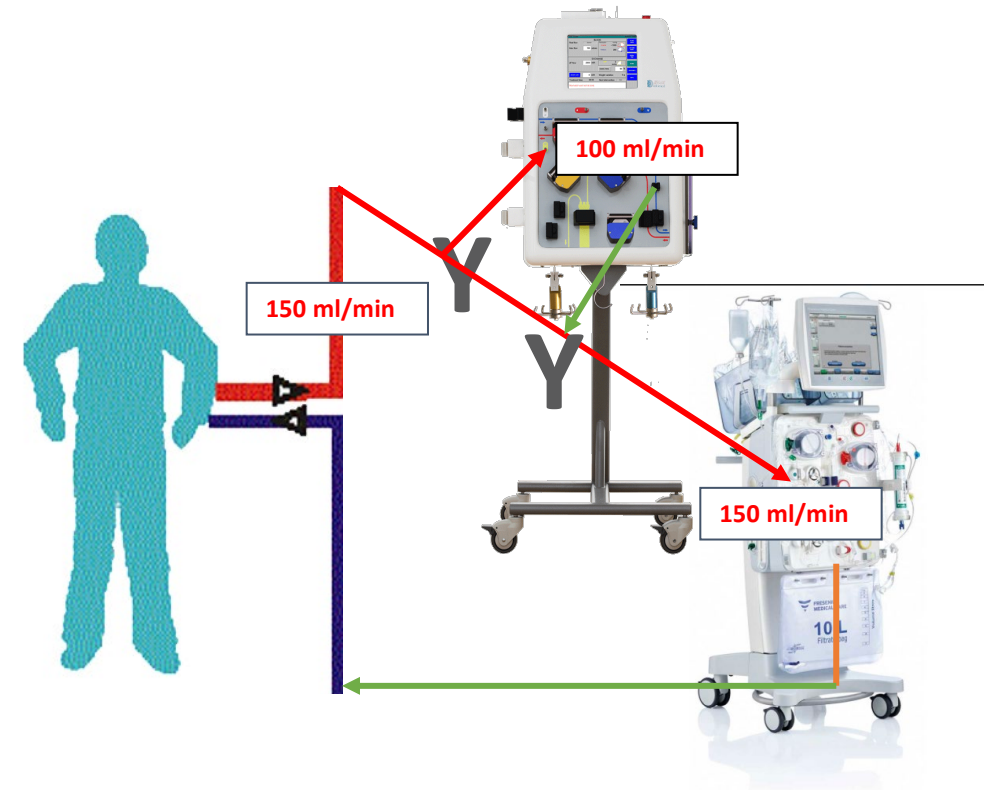


3/ The sequential connection (1)

The TPE machine is connected to the CRRT machine on the entry line

Disadvantages:

- **Pressure issues may occur +++**
- This configuration requires 2 Y-piece connectors



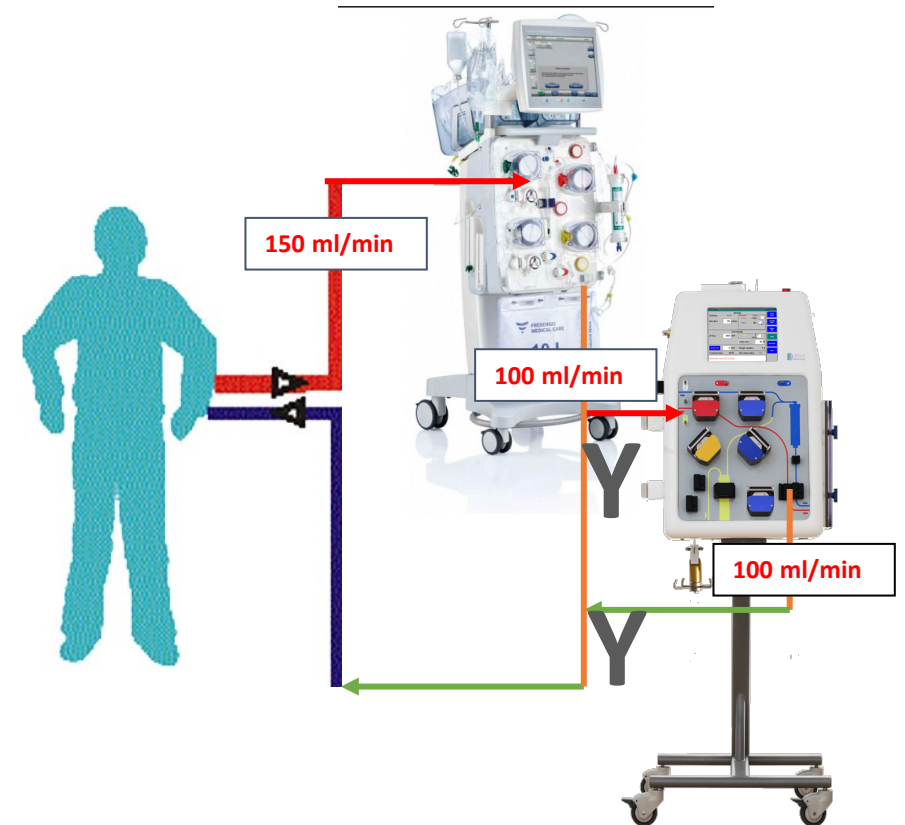
$Q_b \text{ CRRT} > Q_b \text{ TPE}$

4/ The sequential connection (2)

The TPE machine is connected to the CRRT machine on the return line

Disadvantages:

- Decreased risk of pressures issues
- This configuration requires 2 Y-piece connectors

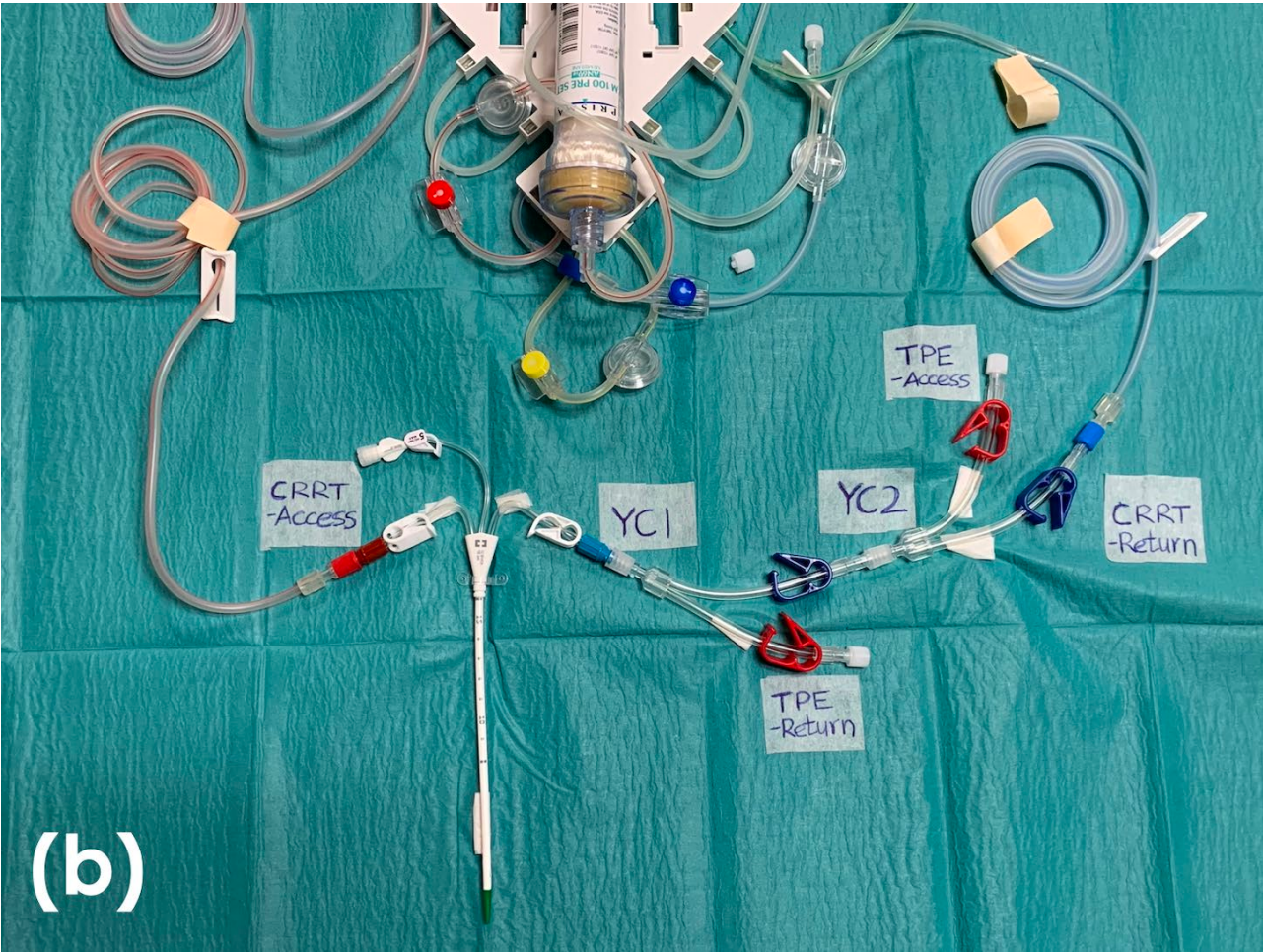
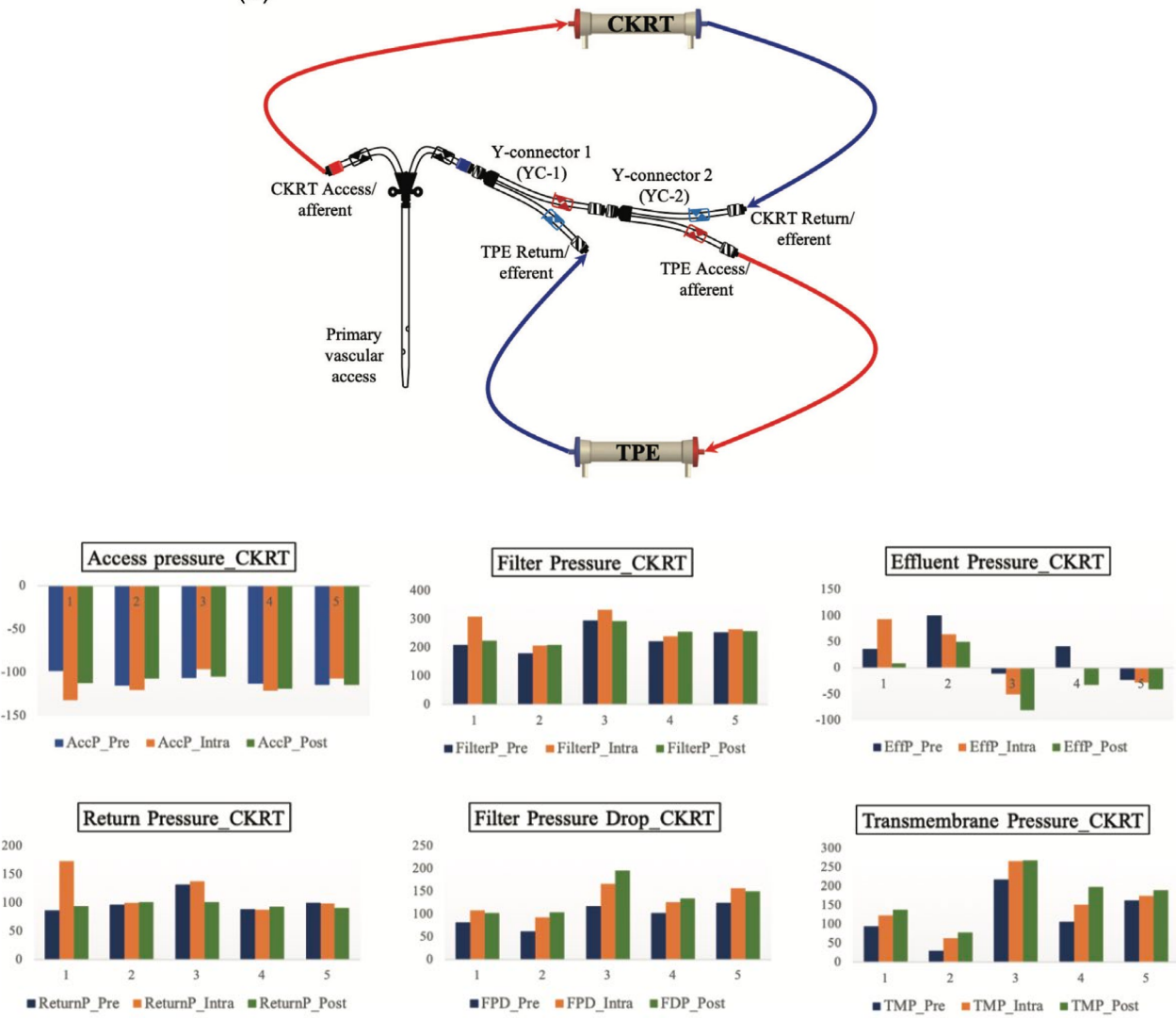


$Q_b \text{ CRRT} > Q_b \text{ TPE}$

Concurrent CRRT with TPE: Series parallel connection

SEQUENTIAL

(B)



Outline

- 1) Nomenclature considerations regarding Tandem CRRT TPE
- 2) Technological aspects for Tandem CRRT TPE
- 3) **What is the main benefit of Tandem CRRT TPE?**
- 4) Is this benefit scientifically demonstrated in the literature?
- 5) What is the most important thing we have to pay attention to when a tandem CRRT TPE session is ongoing?

Question for the audience

What is the main benefit of Tandem CRRT TPE?

- A) It decreases nursing workload**
- B) It makes the whole medical and nursing teams happy**
- C) It saves money**
- D) It reduces the risks related to catheter placement since only one catheter is needed**
- E) It allows for an optimization of the administered CRRT dose**
- F) Tandem CRRT TPE has no benefit**

Chapter 5.8: Dose of CRRT in AKI



5.8.4: We recommend delivering an effluent volume of 20-25 ml/kg/h for CRRT in AKI (1A). This will usually require a higher prescription of effluent volume. (*Not Graded*)

Administered dose / Prescribed dose

Initiation of CRRT	25 ml/kg/h	35 ml/kg/h
Nursing Treatment stopped 2 to 3 times / day (1h)	24 ml/kg/h	33 ml/kg/h
Bag changes (dialysate/Effluent/substitution fluid) (1h)	23 ml/kg/h	31 ml/kg/h
Scheduled stops (surgery – CT scan – <u>TPE</u> - New session...) (>1h)	21 ml/kg/h	29 ml/kg/h
NON scheduled stops (circuit thrombosis – cathéter problem...) (>1h)	<< 20 ml/kg/h	25 ml/kg/h



Outline

- 1) Nomenclature considerations regarding Tandem CRRT TPE
- 2) Technological aspects for Tandem CRRT TPE
- 3) What is the main benefit of Tandem CRRT TPE?
- 4) **Is this benefit scientifically demonstrated in the literature?**
- 5) What is the most important thing we have to pay attention to when a tandem CRRT TPE session is ongoing?

Tandem Therapeutic Plasma Exchange Reduces Continuous Renal Replacement Therapy Down-time

Matthew J. Foglia, MD, PhD¹, Jonathan H. Pelletier, MD², Hülya Bayir, MD^{1,2,3,4}, Annette Fleck, BSN, RN, CCRN^{2,3}, Leslie Konyk, BSN, RN, CCRN^{2,3}, Coleen McSteen, BSN, RN, CCRN^{2,3}, Dawn Fisher, RN, CCRN^{2,3}, Dana Y. Fuhrman, DO, MS^{1,2,3}

¹Department of Pediatrics, UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA, USA

²Division of Pediatric Critical Care, Department of Critical Care Medicine, University of Pittsburgh School of Medicine, UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA, USA

³Pediatric CRRT Program, UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA, USA

⁴Children's Neuroscience Institute, UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA, USA

- **Retrospective cohort study of 116 critically ill children undergoing CRRT**
- **January 2014 to July 2020**
- **University of Pittsburgh**
- **April 2018: Tandem TPE protocol whereby TPE and CRRT could run in parallel without pausing CRRT**

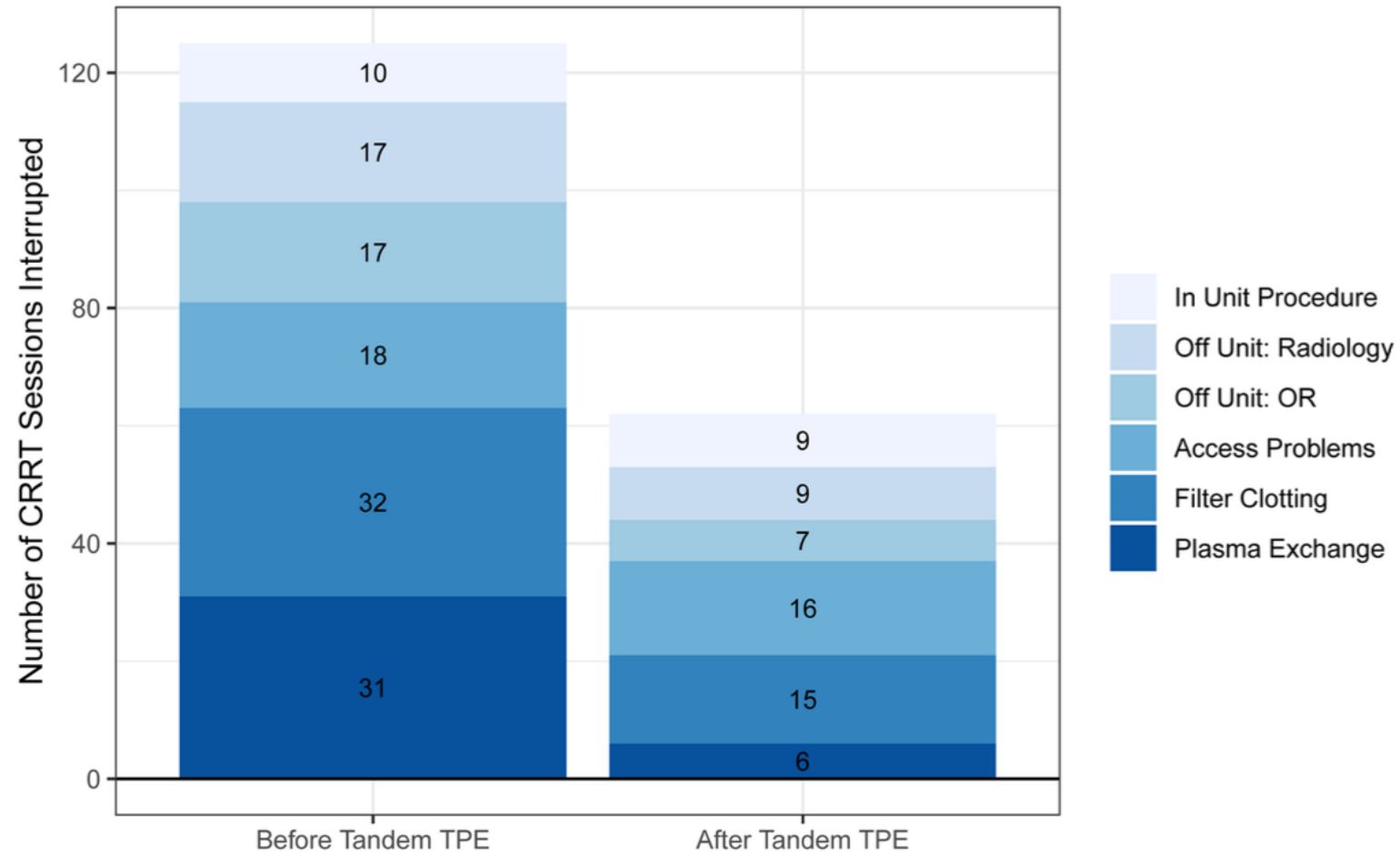


Fig. 2.

Reasons for continuous renal replacement therapy (CRRT) interruptions. The total number of interruptions to CRRT sessions during the study period plotted before and after the initiation of therapeutic plasma exchange (TPE) and subdivided by the reason for circuit interruption. Some sessions had multiple interruptions.

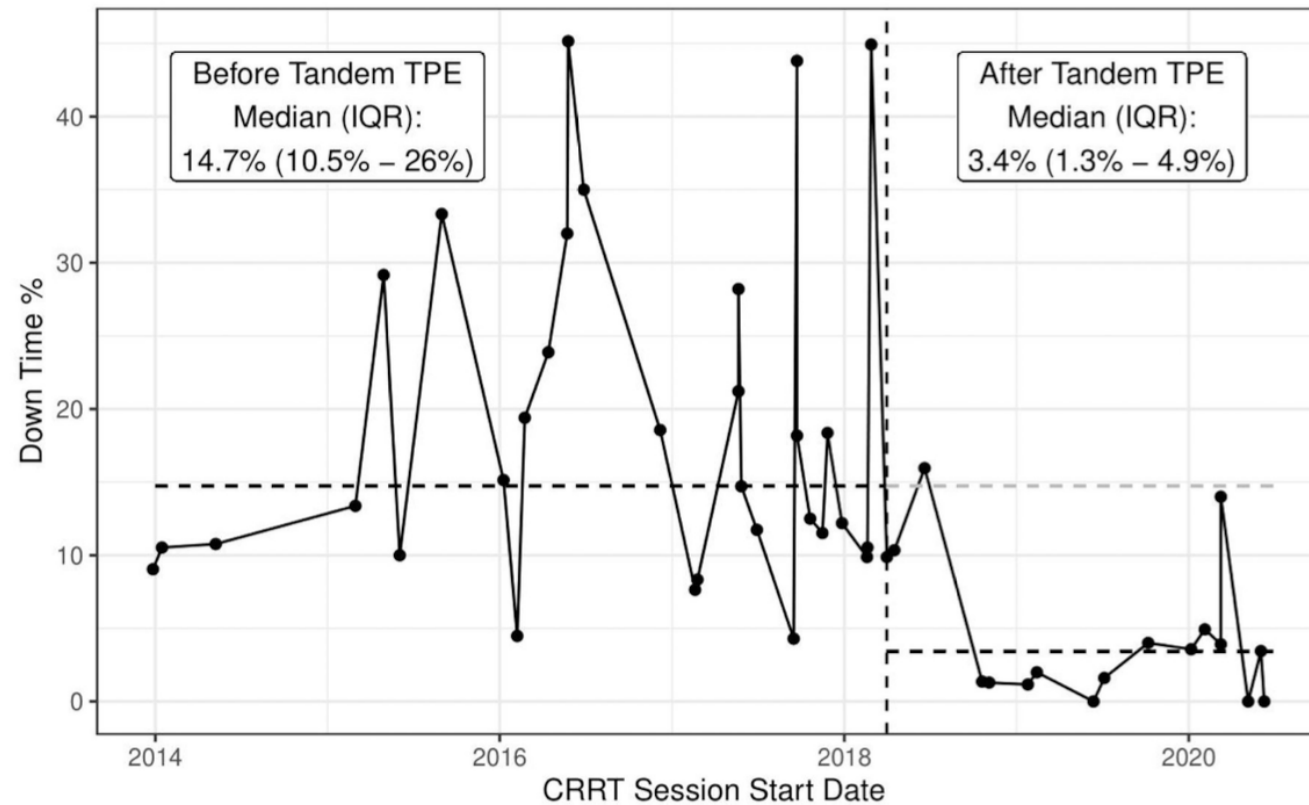


Fig. 4. Tandem therapeutic plasma exchange (TPE) reduces continuous renal replacement therapy (CRRT) down-time. The percentage of each CRRT session performed on patients who also received TPE during the study period was plotted by start date. The median down-time percentage before and after initiation of the tandem TPE protocol in April 2018 is indicated.

Additional advantages of tandem CRRT TPE

- Less modifications of the drug concentrations due to the multiple stops and restarts in case of no tandem
- Less hemodynamic disturbances due to the multiple stops and restarts in case of no tandem
- Less nursing/staffing workload
- Less risk related to catheter placement procedure (only one vascular access)
- Reduction of the total procedure and staffing time
- Less fluid accumulation in patients (children+++++) due to the reduction of the down-times

Outline

- 1) Nomenclature considerations regarding Tandem CRRT TPE
- 2) Technological aspects for Tandem CRRT TPE
- 3) What is the main benefit of Tandem CRRT TPE?
- 4) Is this benefit scientifically demonstrated in the literature?
- 5) What is the most important thing we have to pay attention to when a tandem CRRT TPE session is ongoing?**

Question for the audience

What is the most important thing we have to pay attention to when a tandem CRRT TPE session is ongoing?

- A) The circuit pressures**
- B) The Y-piece connectors are correctly placed**
- C) The medical and nursing teams are still happy!**
- D) My team is skilled and thus can mitigate and deal with the potential complications associated with these complex procedures/circuits**
- E) We have really saved money by running Tandem CRRT TPE**

Conclusion: 3 take-home messages

Tandem CRRT TPE:

- 1) 4 types of settings doable thanks to the Y-piece connectors
- 2) Allows for an optimization of the CRRT administered dose
- 3) Decreases the nursing workload BUT those circuits are complex so the team cannot be beginners (doctors and nurses)

