

RRT modality: diffusion or convection?

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10% of critically-ill patients undergo Renal Replacement Therapy (RRT) during their ICU stay. RRT can be administered according to various modalities, based on the duration of the session (continuous or intermittent) and on the mechanism used for solute removal (convection or diffusion). In order to make the right choice for one specific patient, three questions should be addressed: Do I need to optimize hemodynamics and renal recovery in this patient? Can I optimize my filter lifespan with the choice of the CRRT modality? Can I also optimize the molecular clearances over time?

Continuous modalities (CVVH, CVVHD, CVVHDF) provide greater hemodynamic stability during the session, facilitate the volume status control, the electrolyte and acid-base status and avoid solute swings reducing the risk of cerebral edema. In addition, recent evidence suggests that this optimized hemodynamic tolerance may promote better renal recovery in these patients with severe AKI¹.

In 2020, Regional citrate anticoagulation should definitely be our first choice for RRT anticoagulation. Indeed, as compared to heparin, regional citrate anticoagulation provides less bleeding complications, a higher filter life time and less unwanted stops of the CRRT treatment, which means that the administered RRT dose is optimized. The combination of citrate anticoagulation and continuous hemodialysis (CVVHD) is interesting because CVVHD can be administered with a low blood flow rate, between 80 to 150 ml/min. Since the amount of citrate administered is directly function of the blood flow rate, CVVHD allows for the administration of small amounts of citrate, thus limiting the risk of citrate-related metabolic complications².

Last but not least, due to the absence of filtration fraction issue, CVVHD does not lead to hemoconcentration inside the membrane, drastically reducing the risk of « protein cake » formation on the internal surface of the membrane and therefore keeping good filter performance over time. Indeed, this protein cake, sometimes called polarization layer, is known to be responsible for the decrease of the solute clearances over time (clogging mechanism = pore colmatage).

In conclusion, CRRT should be chosen over intermittent hemodialysis in patients who are hemodynamically unstable and/or with trauma brain injury. Moreover, although no study has ever reported that one continuous modality may be superior over the others, CVVHD exhibits interesting properties (low blood flow rate leading to low citrate administration, limited clogging) which should be further explored.

References

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2. Slowinski T, Morgera S, Joannidis M, et al. *Safety and efficacy of regional citrate anticoagulation in CVVHD in the presence of liver failure : the Liver Citrate Anticoagulation Threshold (L-CAT) observational study. Crit Care 2015*