SUPPLEMENTARY DATA

Optimizing Continuous Renal Replacement Therapy in the ICU:

A team strategy.

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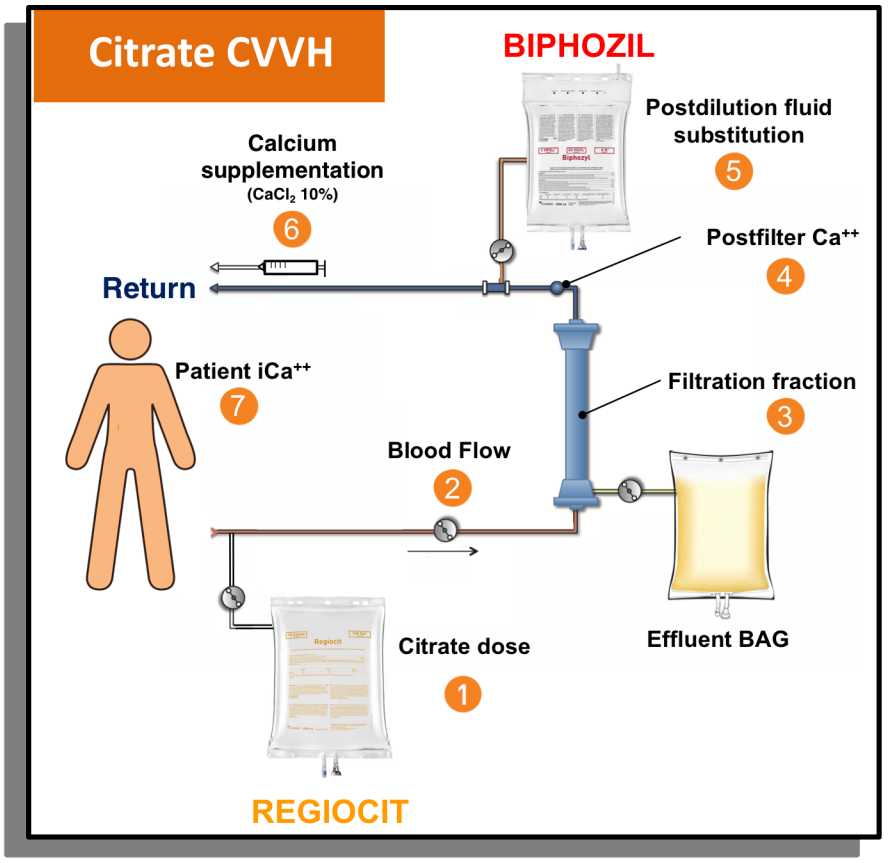
SUPPLEMENTARY ADDITIONAL FILES

Additional file 1: An example of formalized protocol of continuous venovenous hemofiltration (CVVH) using citrate regional anticoagulation (CRA) (from Bordeaux, Marseille and Nice critical care units). Page 1: Set-up schema of CVVH with CRA. Most important settings, targets in term of patient and filter ionized calcium concentrations and alarms required to be checked. Page 2: Target values of Ionized calcium for the patient and for the filter and adjustment guidelines. Protocol of biological monitoring of the patient and the circuit. Signs and corrective actions of side effects and severe complications. Page 3: CRRT monitoring spreadsheet.

CVVH WITH CITRATE and POSTDILUTION without Ca^{++}

DIAGRAM OF THE ASSEMBLY



1	**Citrate dose (mmol/L)**	Start with **3 mmol/L**
2	**Blood Flow (ml/min)**	Target **≤ 180 ml/min** **See Prismaflex initial settings according to patient weigh**
3	**Filtration fraction (%)**	Target **≤ 35 %**
4	**Postfilter Ca^{++} (mmol/L)**	Target **0.3-0.4 mmol/L**
5	**Postdilution fluid substitution WO Ca^{++}**	Target **15-20 ml/kg/hr** **See Prismaflex initial settings according to patient weigh**
6	**Calcium supplementation ($CaCl_2$ 10%)**	Start with **120 %**
7	**Patient iCa++ (mmol/L)**	Target **1.1-1.2 mmol/L**

PRESCRIPTIONS

Prismaflex **initial settings** according to the **patient's weight** ADULTS ONLY

Weight	50-60 kg	60-70 kg	**70-90 kg**	>90 kg
Citrate dose (REGIOCIT)	**3 mmol/L**			
Blood Flow	120 ml/min	140 ml/min	**160 ml/min**	170 ml/min
Postdilution fluid substitution (BIPHOZIL)	1200 ml/hr	1400 ml/hr	**1600 ml/hr**	1900 ml/hr
% Predilution	**0%**			
Calcium supplementation ($CaCl_2$ 1g/10ml)	**120%**			
Fluid removal	at the discretion of the practitioner			

Before initiation, measure iCa^{++} concentration of the patient, if **iCa^{++}< 1.1 mmol/L = delay CRRT initiation**

If < 1,1 mmol/l infuse **iv calcium :** 1 amp of calcium chloride on central venous access or 2 amp of calcium gluconate on peripheral venous access after medical help assistance & prescription

Check a new Ca++ measure 15 min after and repeat the same procedure if iCa^{++} concentration remains <1.1 mmol/l

ADJUSTEMENTS AND DOSAGES

WHEN

Every day

Measure Serum **Total Calcium** and the **ratio Total Calcium / Ionazed Calcium**

Measure Serum **Magnesium** and **Phosphorus**

(Normal range **< 2.5**)

Patient iCa^{++} — Adjustment of % CALCIUM SUPPLEMENTATION ($CaCl_2$)

30 min and 1 hr after initiation

30 min after any adjustment until to reach the target (1.1-1.2 mmol/l)

Every 6 hrs. if Ca++ concentration in the target and stable (2 stable values separated by 1 hr.)

IN CASE OF ANY NON UNDERSTOOD HYPOTENSION

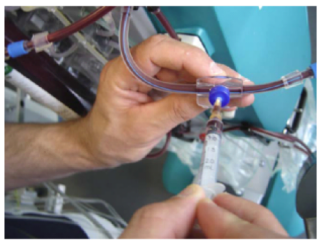
if iCa^{++} <0.85 mmol/l => 2 amp iv of calcium gluconate

Postfilter iCa^{++} — Adjustment of CITRATE DOSE (mmol/l) = anticoagulation of the circuit

30 min after initiation

15 min after any adjustment until to reach the targert (0.25-0.34 mmol/l)

Then every 8 hrs. if Ca++ concentration is in the target and stable



Syringe with subcutaneous needle

HOW

Patient iCa^{++} (mmol/l)	% Ca^{++} SUPPLEMENTATION
>1.5	**STOP** Ca^{++} supplementaion **Call a DOCTOR**
1.4 – 1.5	Reduce (-) Ca^{++} supp by **20 %**
1.3 – 1.4	Reduce (-) Ca^{++} supp by **10 %**
1.2 – 1.3	Reduce (-) Ca^{++} supp by **5 %**
1.1 – 1.2	NO CHANGE — TARGET
1.0 – 1.1	Increase (+) Ca^{++} supp by **5 %**
0.9 – 1.0	Increase (+) Ca^{++} supp by **10 %**
<0.9	Increase (+) Ca^{++} supp by **20 %** **Call a DOCTOR**

Postfilter iCa^{++} (mmol/l)	CITRATE DOSE (mmol/l)
>0.5	Increase (+) citrate dose by **0.4** **Call a DOCTOR**
0.4 – 0.5	Increase (+) citrate dose by **0.2**
0.3 - 0.4	NO CHANGE — TARGET
0.2 – 0.3	Reduce (-) citrate dose by **0.2**
<0.1	Reduce (-) citrate dose by **0.4** **Call a DOCTOR**

BE CAREFFUL

Patient iCa^{++} — Call a DOCTOR

If **Ca^{++} supplementation** comes out of the range of **<80% >140%**

If **3 successive increases** in Ca^{++} supplementation

If **iCa^{++} <0.85 mmol/l** => **2** am iv of **calcium gluconate**

Resistant hypocalcemia => first sign of citrate accumulation

Postfilter iCa^{++} — Call a DOCTOR

If **postfilter iCa^{++}** comes out of the range of **< 0.1 – > 0.5 mmol/l**

If **citrate dose** comes out of the range of **2.5 - 4.5 mmol/l**

Acid/Base — Call a DOCTOR

If pH comes out of the range of **≥7.35 ≤ 7.45**

If Acidosis : Liver test, lactatemia and ratio Ca^{++} Total / iCa^{++}. If **ratio ≥ 2.5 = Citrate accumulation syndrome**, citrate STOP and EER follow-up

If Alkalosis : Citrate loading too high, decrease the blood flow or increase post dilution.

Date: ___ / __ / ____

		7 am	8 am	9 am	10 am	11 am	12 am	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm
TREATMENT	Postdilution replacement (ml/hr)												
	Fluid removal (ml/hr)												
	Filtration Fraction (%)												
CIRCUIT	**Circuit** iCa^{++} (mmol/L)												
	CITRATE DOSE at equilibrium												
PATIENT	**Patient** iCa^{++} (mmol/L)												
	Total serum Ca^{++} (mmol/L)												
	Ratio Tot Ca^{++} / iCa^{++}												
	Calcium supplementation %												
ACID - BASE	pH / BE	/	/	/	/	/	/	/	/	/	/	/	/
	Phosphorus (mmol/L)												
	Blood Flow (ml/min)												
PRESSURE	Access (mmHg)												
	Return (mmHg)												
	Loss of charge (ΔP, mmHg)												
	Transmembrane Pressure (TMP)												

Date: ___ / __ / ____

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PATIENT	**Patient** iCa^{++} (mmol/L)												
	Total serum Ca^{++} (mmol/L)												
	Ratio Tot Ca^{++} / iCa^{++}												
	Calcium supplementation %												
ACID - BASE	pH / BE	/	/	/	/	/	/	/	/	/	/	/	/
	Phosphorus (mmol/L)												
	Blood Flow (ml/min)												
PRESSURE	Access (mmHg)												
	Return (mmHg)												
	Loss of charge (ΔP, mmHg)												
	Transmembrane Pressure (TMP)												

Initial settings

iCa^{2+} patient (before connection)		
CVVH ☐	Filter:	
BLOOD FLOW (≤ 180)		
REINJECTION		
FLUID REMOVAL		
CITRATE DOSE	3	
CALCIUM CHLORIDE SUPPLEMENTATION	120	
MAGNESIUM CHLORIDE SUPPLEMENTATION	2.5	

Dr : / ___ hr

WEIGHT:	kg

EVENTS

Hrs	action(s)