ALTERNATIVES TO HEPARIN ANTICOAGULATION DURING SLOW EXTENDED DAILY DIALYSIS IN THE ICU

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BACKGROUND

- Slow Extended Daily Dialysis (SLEDD) is a well tolerated method of Renal Replacement Therapy in ICU patients

- Concern exists about the amount of heparin that is used to maintain the dialysis circuit in most critically ill patients. This is particularly true when a patient has antibodies to heparin.

- Alternative methods utilized to perform dialysis in these situations include, frequent saline flushes, citrate based dialysate (Citrasate®), and regional citrate anticoagulation

- _In this report, we review our experience with alternatives to heparin-based anticoagulation during SLEDD treatments among the critically ill admitted to UC Davis Medical Center_

METHODS

- Patients receiving SLEDD in the Intensive Care Units, 2005-2006.
- For inclusion, patients were = 18 years, on no systemic anticoagulation, and on SLEDD without heparin use.
- Alternatives to heparin included:
  1. **Saline flushes** with 200 cc at least every hour
  2. **Citrasate®:** (2.5meq/L) citrate-based dialysate
  3. **Regional citrate: ACD-A** (0.113 mol/L) & Calcium gluconate (40mg/ml)
- Clotting was defined as early discontinuation of dialysis, greater than 30 minutes prior to prescribed time because of circuit clotting in lines, chambers, or dialyzer.
- Data was abstracted by chart review and groups were compared using Chi-Square, T-test and ANOVA

Slow Extended Daily Dialysis Technique

SLEDD Prescription: 6-8 hours, Qb=200 ml/min, Qd=400 ml/min, with either standard acid dialysate or Citrasate® 30 brand dialysate.

ACD-A Protocol: Goals - pt's $_iCa^{2+}$ [1.11-1.31], Circuit $_iCa^{2+}$ [0.35-0.50]. ACD-A (citrate) infused proximally in the circuit, calcium gluconate in separate central venous access.

Data collected: Record any dialysis related adverse event, continuous cardiac monitoring, mean arterial pressure, ionized Ca^{2+} when indicated, and any chamber, circuit or dialyzer clotting.
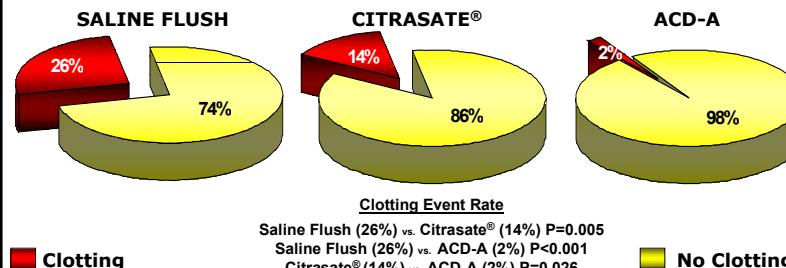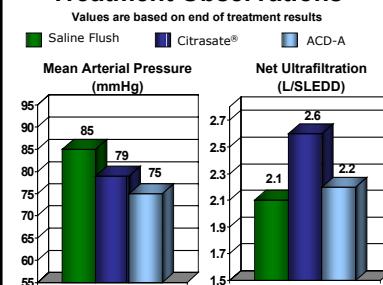
RESULTS

Baseline Characteristics

	Saline Flush (n=97 pts) 336 treatments	Citrasate® (n=19 pts) 72 treatments	ACD-A (n=16 pts) 87 treatments	P value
Age (yrs)*	58 (± 16)	50 (± 14)	57 (± 14)	<0.01
Women (%)	36	81	23	<0.01
Pressors (%)	16	28	34	<0.01
SLEDD treatment per pt†	3.5 (1-28)	3.8 (1-14)	5.4 (1-34)	0.01
Actual treatment time (hr)*	5.8 (± 1.34)	5.9 (± 1.22)	6.1 (± 1.1)	0.11 NS
Average Starting BP (mmHg)	130/60	126/62	122/58	0.35 NS

*Values expressed as means (±SD), or † expressed as means (ranges)

Clotting Episodes

SALINE FLUSH — Clotting 26%, No Clotting 74%
CITRASATE® — Clotting 14%, No Clotting 86%
ACD-A — Clotting 2%, No Clotting 98%

Clotting Event Rate
Saline Flush (26%) vs. Citrasate® (14%) P=0.005
Saline Flush (26%) vs. ACD-A (2%) P<0.001
Citrasate® (14%) vs. ACD-A (2%) P=0.026

🟥 **Clotting**   🟨 **No Clotting**

Treatment Observations

Values are based on end of treatment results

🟩 Saline Flush   🟦 Citrasate®   🟦 ACD-A

Mean Arterial Pressure (mmHg): 85, 79, 75
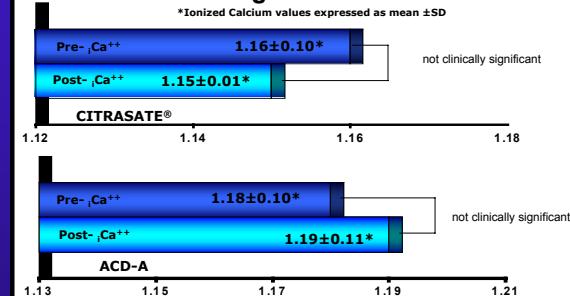**Net Ultrafiltration (L/SLEDD)**: 2.1, 2.6, 2.2

Regional Citrate Management

Initial ACD-A Infusion
176 (±40) cc/hr
47% required adjustments, only 3% required 3 or more

Achieved mean sys-iCa
0.42 (±0.07) mmol/L

Initial Calcium gluconate Infusion
112 (±31) cc/hr
55% required adjustments, only 16% required 3 or more

Achieved Pt-iCa, Post- SLEDD
1.19 (±0.11) mmol/L

RESULTS - CONTINUED

Monitoring of Ionized Calcium

*Ionized Calcium values expressed as mean ±SD

CITRASATE®
Pre- $_iCa^{++}$: 1.16±0.10*
Post- $_iCa^{++}$: 1.15±0.01*
not clinically significant

ACD-A
Pre- $_iCa^{++}$: 1.18±0.10*
Post- $_iCa^{++}$: 1.19±0.11*
not clinically significant

DISCUSSION

- SLEDD was a safe, effective and well-tolerated method of renal replacement therapy in all ICU patients in this study
- Saline flushes, the most commonly employed alternative to heparin, was least effective at preventing circuit clotting
- Citrasate® was more effective in maintaining the circuit than saline flushes, and appears to safe for use in SLEDD
- We observed no clinically significant hypocalcemia events using either Citrasate® or regional citrate
- Regional citrate, using our protocol, was the superior method to keep the dialysis circuit from clotting.
- Our regional citrate protocol was safe and required limited adjustments in about half of all treatments
- It appears that regional citrate and Citrasate® can safely be used for SLEDD treatments in critically ill patients

LIMITATIONS

- Retrospective, observational, single center Review
- Small cohorts, non-randomized