CITRATE DIALYSATE IN ADVANCED LIVER FAILURE

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BACKGROUND:

- Anticoagulation for continuous dialysis therapies is particularly challenging in patients with increased risk of bleeding.
- Systemic anticoagulation is unsafe, regional citrate increases the risk of citrate accumulation and its toxicity along with hypo-calcemia, alkalosis and hypernatremia.
- Citrate containing dialysate (CD) has been safely and effectively used for heparin free intermittent hemodialysis and CRRT.
- Since the liver is a major site of citrate metabolism, the safety of CD in liver failure patients needed to be evaluated.

PATIENTS & METHODS:

- During 2005, Twenty-three hemodynamically unstable ICU patients at the University of Washington Medical Center had advanced liver failure and also had a risk of bleeding thus requiring heparin free CRRT (Slow Low Efficiency Dialysis or SLED).
- These patients underwent 77 heparin free SLED treatments using CD (Citrasate®, Advanced Renal Technologies, Bellevue, WA).

UNDERLYING CONDITIONS:

Most patients in addition to Advanced Liver Failure and/or liver transplantation had additional underlying conditions such as sepsis, hypotension, or other than liver transplantation, such as stem cell transplant : in addition to the co-morbidities of Multiple Organ Failures, HIT and Sepsis.

SLED TREATMENT HIGHLIGHTS:

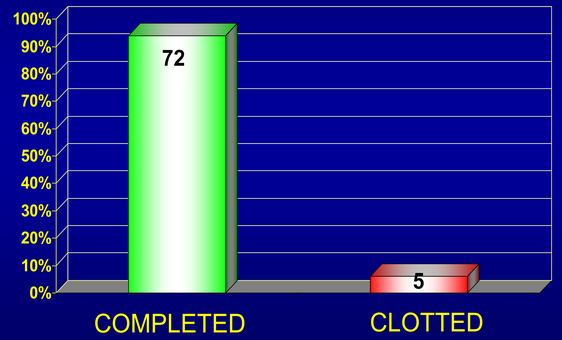
Blood Flow Rate: 201 ± 70 ml/min.
Dialysate Flow Rate: 269 ±139 ml/min.
Dialyzers used: Polyflux 6L, 8L & 10L and F– 5.
Duration: 2 - 24 hours; average 9.5 ± 4.4 hours

COMPLETED TREATMENTS is defined as completion of treatment duration as ordered or ≥ 6 hours.

CLOTTED TREATMENTS is defined as treatment stopped due to clots before the completion of ordered duration.

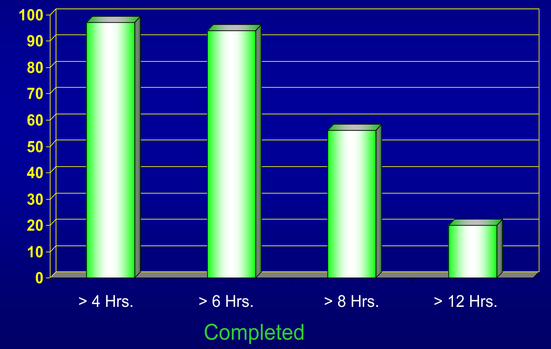
Clot Free SLED With No Heparin

TREATMENTS, % for SLED as ordered or duration of ≥ 6 hours

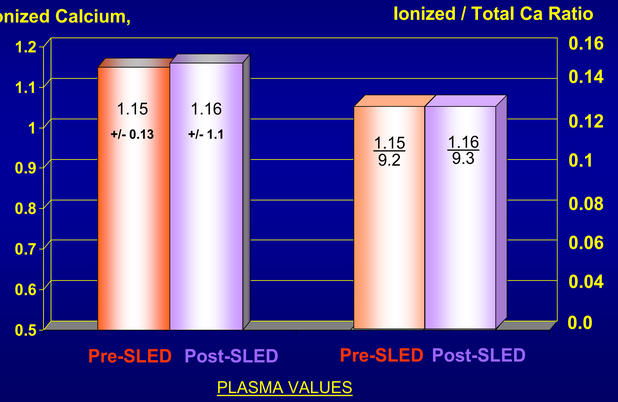


Clot Free Treatments

Treatment %



Ionized Ca & Ionized to Total Ca Ratio



Blood Concentrations

	iCa	Mg	HCO3	Anion Gap
PRE-SLED	1.14	2.0	22.5	14.8
Post-SLED	1.15	1.8	26.0	12.6
p	NS	0.001	0.008	0.007
Normal Range:	1.18 – 1.38	1.3 – 2.1	22 - 29	10 - 12

SUMMARY & CONCLUSIONS:

- During 2005 all UWMC patients requiring CRRT received SLED dialysis treatments.
- Patients with a contraindication to heparin used CD for heparin free SLED treatments.
- Twenty three patients had significantly compro-mised liver function and, even in these acutely ill patients, the CD was well tolerated without any adverse events.
- Ninety-four percent of SLED treatments were successfully completed (>6 hrs.) with CD.
- The CD for long treatments was well tolerated with no adverse events noted.
- Even with non-functioning livers the use of CD was not associated with accumulation of citrate as judged by both the ionized to total calcium ratio. as well as the decrease in the anion gap.
- No hypocalcemia or hypernatremia was noted.
- A significant decline in magnesium and increase in bicarbonate were seen but both values remained in the normal ranges.
- Long slow SLED dialysis using CD is a viable alternative for heparin free treatment of acutely ill patients, even those with liver failure.
- Extended SLED treatments of as long as 24 hours showed no evidence of citrate accumulation or hypocalcemia despite hepatic failure.