

# HIGH CITRATE DIALYSATE IS SAFE AND PERMITS HEPARIN FREE CHRONIC HEMODIALYSIS (HD)

Mary Dittrich, MD<sup>1</sup>, Robin Callan, LLM<sup>2</sup>, Suhail Ahmad, MD<sup>3</sup>. <sup>1</sup>Boise Kidney & Hypertension Institute, Meridian, ID, <sup>2</sup>Advanced Renal Technologies, Bellevue, WA, <sup>3</sup>University of Washington, Seattle, Washington, USA

## BACKGROUND:

- ◆ Citrate dialysate (CD) is a bicarbonate dialysate acidified using 2.4 mEq/L of citrate.
- ◆ CD has been shown to increase delivered dose (Kt/Vurea) of dialysis.
- ◆ CD is often used for heparin free acute dialyses.
- ◆ The above suggest that CD prevents clotting of dialyzers and dialysis system.
- ◆ However, clotting of the system is still encountered in some treatments.
- ◆ It is proposed that using a higher citrate concentration (4.0 mEq/L, "CD 4.0") would be more effective in permitting heparin reduction.
- ◆ The study evaluated:
  - ◆ The safety of CD 4.0, by clinical observations and monitoring ionized Ca, total Ca and Mg.
  - ◆ The efficacy of CD 4.0 by:
    - ◆ The dose of dialysis (Kt/Vurea and URR).
    - ◆ The ability to successfully reduce heparin.

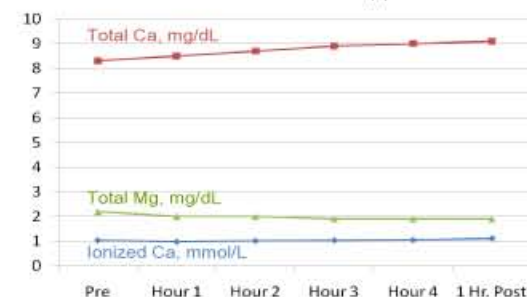
## PATIENTS & METHODS:

10 chronic HD patients dialyzing 3 times a week consented to participate. The study involved four experimental dialyses:

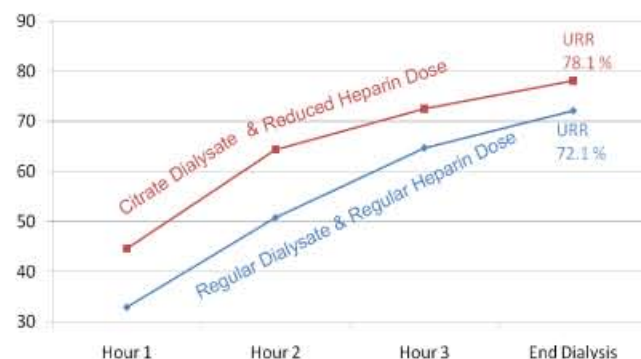
1. Regular dialysate and heparin (5167 u).
  2. CD 4.0 and regular heparin dose.
  3. CD 4.0 dialysate and 1/2 heparin dose (2894 u).
  4. CD 4.0 dialysate and heparin free (0 u).
- ◆ Hourly measurements of ionized (iCa), total Ca (tCa), urea, Mg, and other electrolytes were taken at the participants bedside.
  - ◆ The dialysis circuits and dialyzers were observed for any clotting as well as the line pressures were also continuously monitored

## Hourly Total Calcium, Magnesium and Ionized Calcium

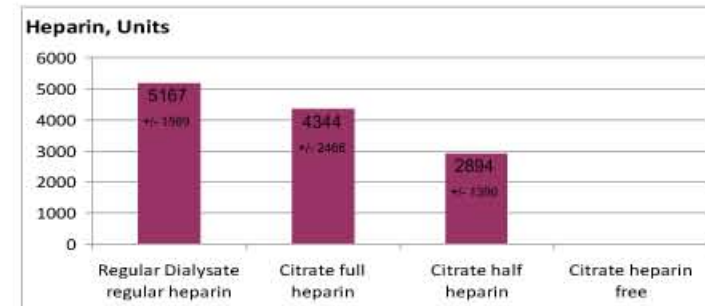
(Normal Reference Ranges: Total Calcium 8.5 to 10.5 mg/dL, Magnesium 1.6 to 2.5 mg/dl and Ionized Calcium 1.18 to 1.32 mmol/L)



## URR by Hour with Regular Dialysate and Citrate Dialysate

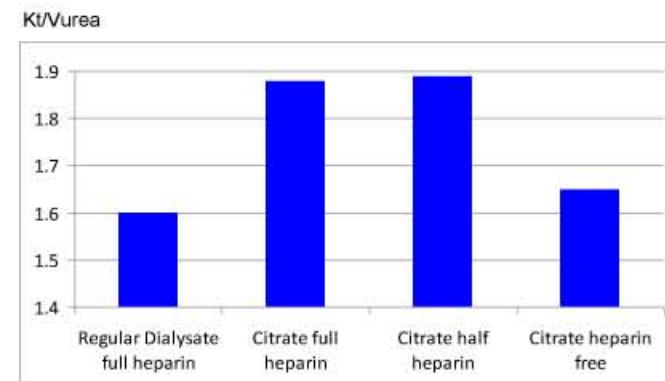


## Heparin Dose per Dialysis



NOTE: The average "full" heparin used in the first citrate dialysate treatment is reduced because two patients were treated heparin free for medical reasons.

## Dialysis Dose (Kt/Vurea)



## RESULTS:

- ◆ All dialyses with CD 4.0 were without any complications; patients tolerated each treatment well.
- ◆ The dialyzers and tubing sets did not show excessive clotting.
- ◆ Two of 10 heparin free treatments were terminated early due to line pressure alarms - both in the final 30 minutes of the treatment.
- ◆ No patient had any symptoms of hypocalcemia or hypomagnesemia.
- ◆ The dialysis dose did not decrease from baseline either during heparin reduced or heparin free dialysis.

## SUMMARY & CONCLUSIONS:

- ◆ Higher citrate dialysate (CD 4.0) was well tolerated without any complications.
- ◆ CD 4.0 did not significantly reduce ionized or total Ca and was found to be safe for chronic dialysis.
- ◆ CD 4.0 permitted successful completion of dialysis treatments with a 50% reduction in heparin.
- ◆ The dose of dialysis with CD 4.0 increased significantly even with 50% reduction in heparin.
- ◆ 80% of the heparin free dialyses were successfully completed with CD 4.0 use.
  - ◆ The two partially completed treatments both had higher Kt/V results than their baseline.
- ◆ This first study in chronic HD patients shows that higher citrate dialysate (CD 4.0) is safe to use, is effective in permitting heparin reduction and, was associated with a higher dose of dialysis.