

Correlates of intradialytic change in serum sodium: the roles of pre-dialysis dialysate-to-serum sodium gradient and treatment time.

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Introduction and Aims

In hemodialysis (HD) patients, sodium concentrations in the dialysate (DNa^+) and serum (SNa^+) and the resulting sodium gradient (GNa^+) affect SNa^+ changes during HD. A rise of SNa^+ post-dialysis may increase osmolality and trigger post-dialytic thirst. GNa^+ is a potentially modifiable determinant of post-HD SNa^+ (Hecking, Am J Nephrol 2011). Here we expand current knowledge by investigating the influence of treatment time on post-HD SNa^+ in three datasets encompassing dialysis patients undergoing HD with distinctly different treatment times.

Methods

In this observational study we investigated patients undergoing conventional, short daily and long nocturnal HD. The association between pre-HD GNa^+ and the post-HD minus pre-HD SNa^+ difference (PPSD) was assessed by simple linear regression. To account for multiple measurements per patient, a linear mixed model (LMM) was developed with random intercepts and slopes with PPSD as the dependent variable, and pre-HD GNa^+ and treatment time as fixed effects.

Results

We studied 188 HD patients with the following treatment characteristics: a) conventional HD (n=65; average treatment time: 152 minutes); b) short daily HD (n=25; average treatment time: 126 minutes) and c) long nocturnal hemodialysis (n=98, treatment average time: 422 minutes). Pre-HD GNa^+ significantly predicted PPSD in all three patient groups (see Figure 1 for correlation coefficients), and in the entire (pooled) dataset ($R^2=0.44$). LMM analysis corroborated GNa^+ as a predictor of PPSD (estimated slope 0.55 mEq/L; intercept -1.05 mEq/L; both $P<0.001$). Treatment time was not associated with PPSD (estimated slope -0.001 mEq/L per minute; $P=0.5$).

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Conclusion

While PPSD is predictable based on pre-HD GNa^+ , it is not correlated with treatment time. This may be due to the dominant initial effect (reflected by the magnitude of the estimate in comparison to the estimate of treatment time in the model) of GNa^+ in the first one or two hours of HD, which dissipates later in the treatment. Formal intradialytic studies of sodium kinetics should provide further insights into the dynamics of SNa^+ change during HD.

Figure 1: Post-HD minus pre-HD serum sodium concentrations (PPSD) as a function of the pre-HD GNa^+ in patients undergoing HD with three different treatment times.

Graph a) 841 conventional treatments, **b)** 673 nocturnal treatments, **c)** 315 short daily, 563 nocturnal and 43 conventional treatments and **d)** 315 short daily, 884 conventional and 1236 nocturnal treatments.

