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Opinion

Sodium Dialysate Prescription in a New Dialysis Facility

Charles Chazot

AURA Paris, 94200 Ivry sur Seine, France; chchazot@gmail.com

Abstract: As the Medical Director of this new dialysis facility, I recommend a fixed sodium dialysate (Na_{dial}) concentration at 138 mEq/L. This relates to my former experience in the Tassin unit in France and the fear of sodium as a powerful uremic toxin. I realize that, according to the Na^+ set-point theory, a fixed value of the Na_{dial} may create a plasma–dialysate (P–D) gradient and may favor intradialytic plasma Na^+ changes. In cases where this is associated with signs of negative Na^+ balance (bad session tolerance/quality of life) or positive Na^+ balance (high interdialytic weight gain or high blood pressure), individualization of the Na_{dial} to reduce the P–D gradient and change in plasma Na^+ concentration may be useful, even though evidence remains scarce. I look forward to the possibility of using new dialysis machines that allow for the evaluation of sodium balance and tailoring of the sodium diffusion process.

Keywords: sodium dialysate; plasma-dialysate sodium gradient; interdialytic weight gain; hemodialysis

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The optimal sodium (Na^+) dialysate (Na_{dial}) prescription remains questioned in the nephrology community, 60 years after the first patients started chronic hemodialysis (HD) therapy for end-stage kidney disease (ESKD). From the 1960s onwards, the majority of nephrologists prescribed a fixed Na_{dial} at different levels. However, as dialysis session tolerance decreased with the shortening of the session time, Na_{dial} manipulation with a fixed or profiled increase has been prescribed [1]. Analysis of this practice displayed evidence of positive Na^+ balance [2]. In 1989, when I started my practice in the Tassin unit, France, treating more than 200 HD patients, the Na_{dial} prescription was uniform at 138 mEq/L. The unit was characterized by a long session time, thrice weekly dialysis, prolonged patient survival and optimal blood pressure (BP) control [3]. This fixed value of Na_{dial} remained the standard prescription, even when session time individualization was implemented in the unit [4].

What are the key factors behind my approach to Na_{dial} prescription?

1. Always Fear Na^+ as a Powerful Uremic Toxin!

The first ever chronic HD patient developed malignant hypertension soon after starting dialysis [5]. Scribner interpreted this condition as being due to an excess of extracellular fluid. The malignant hypertension was cured by removing fluid by ultrafiltration (UF) and consuming a low-salt diet. These are the basics! A low-salt diet is widely recommended for dialysis patients with the objectives of minimizing interdialytic weight gain (IDWG) and reducing the need for UF, and of improving both session tolerance and high BP. If the dialysis session itself creates the conditions for a positive Na^+ balance, then it is a complete contradiction to the former advice. In a Dialysis Outcomes and Practice Patterns Study (DOPPS) cohort, higher prescribed Na_{dial} (>140 mEq/L) has been found to be associated with higher IDWG [6]. So, in my opinion, 138 mEq/L is a reasonable choice. It can be argued that in the same DOPPS cohort, mortality risk increased in patients prescribed with Na_{dial} below 140 mEq/L [6]. However, the over-representation of Japanese HD patients (lowest mortality risk and high Na_{dial} prescription) may have flawed this result. Excluding this specific group, the difference in mortality according to the Na_{dial} prescription became insignificant in the categorical model (i.e., <140 mEq/L versus 140 mEq/L), while in the continuous model, a significantly lower mortality hazard ratio prevailed "per 2

mEq/higher Na_{dial} prescription" (HR = 0.91 (95% CI 0.85–0.97)), which was attenuated in comparison to the previous analyses that had not excluded patients from Japan [7]. More data are required to confirm this last finding.

2. The Na^+ Set-Point and the Plasma–Dialysate Gradient

Predialysis plasma Na^+ concentration has been found to be stable in HD patients [8,9]. This means that whatever the change in plasma Na^+ concentration during the dialysis session, an idiosyncratic mechanism takes it back to the initial predialysis value. When a plasma–dialysate (P–D) Na^+ gradient exists during the session, the Na^+ balance may be altered because of the dialysis diffusion process—a gain if Na_{dial} > plasma Na^+ or a loss if Na_{dial} < plasma Na^+.

3. The Na_{dial} Individualization Temptation

In a recent study, Sagova et al. [10] reported the plasma Na^+ change between the start and the end of the dialysis session under a fixed Na_{dial} concentration at 138 mEq/L. The majority of patients had a decline in plasma sodium during the dialysis session in favor of a negative Na^+ balance. Na_{dial} < 140 mEq/L has been reported to be associated with a 72% increased risk of a longer dialysis recovery time [11]. For symptomatic patients with a Na_{dial} prescribed at 138 mEq/L and a decline in plasma sodium, a higher Na_{dial} can be proposed. For the opposite—patients with a P–D gradient and obvious signs of positive Na^+ balance—it may be useful to decrease the Na_{dial} to reduce the intradialytic Na^+ load and to decrease IDWG and BP. P–D Na^+ alignment has been shown to reduce IDWG but not alter other outcomes [12].

4. The Future

New generations of dialysis machines promise the option of devices to analyze Na^+ balance and modify with the change of plasma sodium during the session [13]. This breakthrough needs more clinical studies to evaluate the potential to improve the patient Na^+ balance and study clinical outcomes.

5. Conclusions

In conclusion, I recommend for my new dialysis unit a default Na_{dial} of 138 mEq/L to avoid a positive Na^+ balance. I propose individualizing this prescription in symptomatic patients with intradialytic changes in plasma Na^+ to avoid a negative or positive Na^+ balance caused by the dialysis diffusion process. I would propose that my unit and patients are invited to participate in clinical studies of new Na^+ devices in future generations of dialysis machines.

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