Pseudohypernatremia in Patients with Hemodialysis Catheters Locked with Trisodium Citrate

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Introduction
- International guidelines recommend arteriovenous fistula (AVF) as the type of preferred vascular access for hemodialysis.
- Infections and patency-related complications from central venous catheters (CVC) pose a potential risk for patients.
- Trisodium citrate (TSC) locking solution is a promising alternative to unfractionated heparin (UFH) for prevention of CVC dysfunction.
- However, pseudohypernatremia secondary to TSC contamination of blood specimens obtained from the CVC may potentially lead to profound but unnecessary diagnostic interventions.

Objective
To analyze pre-dialysis sodium (Na) concentration and the prevalence of pseudohypernatremia in relation to the type of locking solution (TSC vs UFH) and vascular access type in a large cohort of hemodialysis patients.

Methods
- The population studied consisted of 543 prevalent hemodialysis patients (65% female, mean age 67 ± 14 years) treated in a standard hemodialysis program (100% High Flux membranes, 94% HD time ≥12½/week, 94% spKt/V ≥1.3, 18.5% CVC) in Poland.
- We analyzed laboratory results from February and March 2017. The pre-dialysis Na concentration was compared between patients with CVC locked with 30% TSC, UFH (5000 IU/mL), and non-CVC types of VA (AVF, AV graft). The proportion of patients with pre-dialysis Na ≥145 mEq/L (pseudohypernatremia) was analyzed in both groups and from both months separately.
- Data were analyzed using descriptive statistics, ANOVA, t-test, and χ² tests, as appropriate.

Results
- The mean pre-dialysis serum Na concentration was significantly higher in patients with a CVC who used TSC locking solution compared to either those who used a CVC with UFH locking solution, or to those who used either an AVF or AVG for vascular access (Figure 1).
- The highest serum Na concentration was 171 mEq/L. The sample was obtained from a patient with an uneventful follow-up. Repeated analysis of serum drawn from a peripheral vein showed a Na concentration of 138 mEq/L.
- The proportion of serum samples with Na ≥145 mEq/L was significantly higher in patients with CVCs locked with TSC compared to patients with UFH as the locking solution (Figure 2).

Conclusions
- Pseudohypernatremia may occur in hemodialysis patients utilizing a CVC for vascular access when 30% TSC is used as the locking solution.
- The need for diagnostic laboratory investigations may be lowered by strictly following the recommended procedures for blood sample collection from a CVC, This includes discarding a proper volume of blood.

Figures
1. Mean Pre-Dialysis Serum Sodium Concentration by Vascular Access and Locking Solution Type
2. Proportion of Pre-Dialysis Serum Sodium Measurements ≥145 mEq/L by CVC Locking Solution

Table
<table>
<thead>
<tr>
<th>Pre-Dialysis Sodium Measurement</th>
<th>CVC-TSC</th>
<th>CVC-UFH</th>
<th>AVF/AVG</th>
</tr>
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<tbody>
<tr>
<td>Na ≥ 145 mEq/L</td>
<td>26%</td>
<td>76%</td>
<td>430%</td>
</tr>
<tr>
<td>Na &lt; 145 mEq/L</td>
<td>35%</td>
<td>24%</td>
<td>40%</td>
</tr>
</tbody>
</table>

ANOVA P = 0.001 for February and March

Abbreviations: AVF, arteriovenous fistula; AVG, arteriovenous graft; CVC, central venous catheter; TSC, trisodium citrate; UFH, unfractionated heparin.

References

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