Hemodynamic Stability During Sorbent-Based Dialysis with the 2008 Sorbent Hemodialysis System

Laura Rosales¹, Yanna Dou¹,², Stephan Thijssen¹,², Mary Carter¹, Nathan W. Levin¹ and Peter Kotanko¹,²

¹Renal Research Institute, New York, NY, USA; ²Beth Israel Medical Center, New York, NY, USA

Introduction and Aims

The 2008 Sorbent Hemodialysis (HD) System (Renal Solutions, Inc., Warrendale, PA), FDA approved for chronic hemodialysis, regenerates the dialysate fluid and, therefore exposes the patient to only up to 14 liters of dialysate per treatment. Hemodynamic stability during hemodialysis is of considerable importance and is clearly related to subsequent morbidity and mortality [1,2].

In this prospective observational study, we investigated hemodynamic stability during treatments with the 2008 Sorbent HD System.

Methods

Chronic HD patients using high-flux dialyzers (Optiflux: Fresenius Medical Care, Walnut Creek, CA) were switched to the 2008 Sorbent HD System for one week (up to three treatments). Systolic (SBP), diastolic (DBP), mean arterial (MAP) blood pressure and heart rate (HR) were measured before HD (pre-HD), every 15 min during the treatment, and after HD (post-HD). Episodes of intradialytic hypotension (IDH), defined according to KDOQI guidelines as a decrease in SBP by >20 mmHg or in MAP by >10 mmHg associated with clinical symptoms, were recorded. Serum/plasma concentrations of sodium (Na), potassium (K), ionized calcium (iCa) and chloride (Cl) were measured pre-HD and post HD every treatment. BP, HR and serum electrolyte levels were compared between pre- and post-HD by paired t-test.

Table 1: Pre-dialysis and post-dialysis blood pressure and heart rate (n=9)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre-HD (mean±SD)</th>
<th>Post-HD (mean±SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP [mmHg]</td>
<td>149.6 ± 27</td>
<td>152.6 ± 28.7</td>
<td>0.52</td>
</tr>
<tr>
<td>DBP [mmHg]</td>
<td>92.7 ± 13.7</td>
<td>92.9 ± 15.4</td>
<td>0.94</td>
</tr>
<tr>
<td>MAP [mmHg]</td>
<td>106.1 ± 16.1</td>
<td>105.9 ± 16.6</td>
<td>0.94</td>
</tr>
<tr>
<td>Heart Rate [min⁻¹]</td>
<td>80.6 ± 12.1</td>
<td>74.5 ± 9.8</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Results

Nine patients (age: 46.8 ± 14 years; 8 males) were studied during a total of 20 treatments (HD duration: 221 ± 22 min; intradialytic weight loss: 3.2 ± 0.6 kg; volume removal: 3574 ± 601 ml, blood flow rate: 400 ml/min; dialysate flow rate: 364 ± 44 ml/min; SpKt/V: 1.32 ± 0.15).

Heart rate decreased significantly from pre-HD to post-HD (80.6 ± 12.1 vs. 74.5 ± 9.8 min⁻¹, P<0.01, Table 1). None of the patients experienced an episode of IDH during any of the 20 study treatments. No patient experienced a fall in systolic BP of 20 mmHg or greater. Serum K dropped during dialysis significantly from 5.2 ± 0.4 to 3.9 ± 0.6 mEq/l, (P<0.001). There were no significant changes in serum Na (pre-HD 138.0 ± 2.4, post-HD 138.2 ± 2.4 mEq/l), Cl (pre-HD 97.3 ± 3.6, post-HD 98.0 ± 2.3 mEq/l), or iCa (pre-HD 1.14 ± 0.2, post-HD 1.11 ± 0.07 mEq/l).

Conclusion

This is the first clinical study performed with the 2008 Sorbent Hemodialysis System. All subjects remained hemodynamically stable throughout each of their treatments, with no incidence of intradialytic hypotension. In addition, serum sodium, chloride and ionized calcium remained stable during dialysis. Larger studies comparing dialysis with the 2008 Sorbent HD System to conventional single-pass HD are required to assess possible differences in hemodynamic stability between these two treatment modalities. The low dialysate volume requirement may make this method applicable in circumstances outside of current in-center HD where water supply may be an issue [3].

References:

