EFFECTS OF POSTDIALYSIS UREA REBOUND (UR) ON EVALUATION OF CHRONIC HEMODIALYSIS (HD) IN CHILDREN

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INTRODUCTION AND OBJECTIVE
Significant urea rebound occurs even after standard pediatric hemodialysis sessions. This requires different interpretation of results obtained by single pool urea kinetic modelling and higher prescribed Kt/V doses. To be able to do this, the effects of UR on UKM results need to be known and quantified. There are either no or few reports that document the effect of UR on various UKM parameters in children. Our objective was to document the impact of UR following standard pediatric HD on the results of formal single pool variable volume (VSVP) UKM (Kt/V, urea distribution volume (V), urea generation rate (G)) expressed as G/V, normalised protein catabolic rate (nPCR), time averaged concentration of urea (TACurea) and effective urea clearance (ef.K) and urea reduction ratio (URR) in children on chronic HD.

PATIENTS AND METHODS
Patients: 15 stable patients (M:6,F:9) aged 14.5±3.28 years, BW: 31.40±7.94 kg, renal urea clearance absent in 10/15 patients and from 0.29-1.59 ml/min/1.73m2 in remaining 5/15.
No of HD sessions: 43 (3 consecutive HD sessions in 13 patients and 2 consecutive HD sessions in 2 patients due to a problem with AV fistula).
HD session characteristics: standard, bicarbonate, duration 3.81±0.44 hours, single pool effective urea clearance 4.84±1.25 ml/min/kg, UF rate 6.2±2.5%.
Urea kinetic modelling: Variable Volume Single Pool UKM with postdialysis urea taken at the end of HD, and with equilibrated urea taken 60 min. after the end of HD incorporating double pool effects. Dialyser clearances used were blood side in vivo values for each HD session. Blood-water flow was used instead of full blood flow.
Urea reduction ratio (URR): URR = 1 - Ct/C01 (Ct - urea postHD for single pool URR, and 60 min. postHD for double pool).
Statistics: the results were compared using Student’s t test for paired samples.

RESULTS
Results are presented on Tables 1 and 2, and Figures 1 and 2.

Table 1: Single pool UKM error in Kt/V on individual HD session basis.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Single pool UKM</th>
<th>Double pool UKM</th>
<th>% difference between the means</th>
<th>P (t-test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G/V</td>
<td>0.22±0.05</td>
<td>0.20±0.04</td>
<td>+10</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>nPCR</td>
<td>1.27±0.28</td>
<td>1.19±0.25</td>
<td>+6.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>effective K</td>
<td>4.84±1.25</td>
<td>4.79±1.23</td>
<td>+1.4</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>URR</td>
<td>0.71±0.07</td>
<td>0.66±0.07</td>
<td>+7.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>V (liters)</td>
<td>19.25±3.73</td>
<td>22.02±4.20</td>
<td>-12.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>TACurea (mmol/l)</td>
<td>17.25±3.22</td>
<td>17.91±3.28</td>
<td>-3.65</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Figure 1: Effect of UR on calculation of Kt/V.

Figure 2: Effect of UR on all results of urea kinetic modeling and URR.

DISCUSSION
Effect of UR on calculation of Kt/V:

- Double pool significantly overestimated: Kt/V by 21±5% (CV=24%) and TACurea by 35%.
- Single pool underestimated: Kt/V by 12.58% (0.29±0.21 vs. 0.22±0.07, p<0.0001) and TACurea by 3.65% (17.91±3.28 vs. 17.25±3.22, p<0.0001).

CONCLUSION
We conclude that urea rebound has a significant effect on all results of UKM even after standard pediatric hemodialysis and the degree of this effect is documented. We suggest an increase of about 0.29 units of the minimum required delivered single pool Kt/V in children and reduction of any single pool Kt/V by approx. 0.29 units. Overestimation of nPCR by approx. 7% and underestimation of kinetic V by approx. 13% should be kept in mind.