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Renal phosphorus regulation in thermally-injured and multiple trauma patients receiving enteral nutrition

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Profound hypophosphatemia is a common complication in thermally injured patients of which the etiology is unclear. To investigate renal phosphorus regulation, 20 adult thermally injured patients (> 20% BSA) and 20 multiple trauma patients requiring tube feedings were prospectively evaluated. Patients with renal impairment (serum creatinine > 1.6 mg/dl), alkalemia (pH > 7.50), or diabetes mellitus were excluded. Serum phosphorus concentrations (mg/dl) were collected at days 1, 3, 7, and 14 after initiation of tube feeding. Tube feedings were begun within 1-3 days post injury. Management of hypophosphatemia was shared by the nutrition support and respective primary services. A 24 hour urine was collected during week 1 and 2 for urinary phosphorus excretion (mg/d) and phosphate clearance (L/d). Data are given a mean ± SD. Average daily phosphate intake during the 14 day study for thermally injured and multiple trauma patients was 0.72 ± 0.32 mmol/kg/d (34 ± 30% as IV) and 0.32 ± 0.18 mmol/kg/d (20 ± 17% as IV), respectively, p < 0.001.

<table>
<thead>
<tr>
<th>Group</th>
<th>P - Day 1</th>
<th>P - Day 3</th>
<th>P - Day 7</th>
<th>P - Day 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermally injured</td>
<td>2.6 ± 0.9</td>
<td>1.9 ± 0.8*</td>
<td>2.7 ± 1.2*</td>
<td>3.9 ± 0.6</td>
</tr>
<tr>
<td>Multiple trauma</td>
<td>2.5 ± 0.7</td>
<td>3.0 ± 0.8</td>
<td>3.3 ± 0.6</td>
<td>3.7 ± 0.6</td>
</tr>
</tbody>
</table>

P = serum phosphorus concentrations
*p < 0.05 between groups

<table>
<thead>
<tr>
<th>Group</th>
<th>UP - Week 1</th>
<th>UP - Week 2</th>
<th>UCL - Week 1</th>
<th>UCL - Week 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermally injured</td>
<td>292 ± 256</td>
<td>377 ± 286</td>
<td>11.8 ± 11.9</td>
<td>14.3 ± 12.1</td>
</tr>
<tr>
<td>Multiple trauma</td>
<td>189 ± 178</td>
<td>272 ± 186</td>
<td>8.5 ± 8.9</td>
<td>8.4 ± 5.7</td>
</tr>
</tbody>
</table>
UP = urinary phosphorus excretion; UCL = urinary phosphorus clearance

Despite a significantly greater intake of phosphorus, thermally injured patients had lower serum phosphorus concentration levels on days 3 and 7. Thermally injured patients had greater urinary phosphate excretion and clearance compared to multiple trauma patients ($p = N.S.$). Thermally injured patients had a 40% to 55% increase in urinary excretion of phosphorus despite an intake that was 125% more than multiple trauma patients. Renal phosphorus regulation is only partially responsible for the profound hypophosphatemia observed in thermally injured patients.