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Jane M. Gervasio
Butler University, jgervasi@butler.edu

Rex O. Brown

Justin J. Sherman

William L. Hickerson

Kenneth A. Kudsk

See next page for additional authors

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Authors

Jane M. Gervasio, Rex O. Brown, Justin J. Sherman, William L. Hickerson, Kenneth A. Kudsk, and Roland N. Dickerson

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

Jane M. Gervasio, Rex O. Brown, Justin J. Sherman, William L. Hickerson, Kenneth A. Kudsk,
Roland N. Dickerson

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 \pm 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 ($34 \pm 30\%$ as IV) and 0.32 ± 0.18 mmol/kg/d ($20 \pm 17\%$ as IV), respectively, $p < 0.001$.

Group	P - Day 1	P - Day 3	P - Day 7	P - Day 14
Thermally injured	2.6 ± 0.9	$1.9 \pm 0.8^*$	$2.7 \pm 1.2^*$	3.9 ± 0.6
Multiple trauma	2.5 ± 0.7	3.0 ± 0.8	3.3 ± 0.6	3.7 ± 0.6

P = serum phosphorus concentrations
* $p < 0.05$ between groups

Group	UP - Week 1	UP - Week 2	UCL - Week 1	UCL - Week 2
Thermally injured	292 ± 256	377 ± 286	11.8 ± 11.9	14.3 ± 12.1
Multiple trauma	189 ± 178	272 ± 186	8.5 ± 8.9	8.4 ± 5.7

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 ($p = \text{N.S.}$). 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.