

A 31 year-old man with DI/panhypopituitarism was stable until his levothyroxine was incorrectly lowered based on TSH levels. He became hypothyroid and was hospitalized 3 times over 1 month for recurring altered mental status and mild hyponatremia. DDAVP was repeatedly held with rapid onset of polyuria resulting severe hypernatremia. On the last admission, he presented with altered mental status from sepsis. Serum sodium was 135 mmol/l. He was made NPO and treated with stress dose hydrocortisone and fludrocortisone. DDAVP was held for the mild hyponatremia. Serum sodium rapidly elevated to 168 mmol/l after only 12 hours. DDAVP was restarted with liberalization of diet to unlimited free water access causing rapid downward sodium correction.

Hypernatremia almost always results from iatrogenic causes. In our case, holding DDAVP for hyponatremia resulted in rapid onset of hypernatremia and volume depletion. Stress dose glucocorticoids further unmasked DI. Thirst and free access to water which typically protects patients with un-replaced DI were not operational due to his NPO status which contributed to the rapid rise in serum sodium.

Water balance is controlled by thyroid, glucocorticoid, and principally ADH working at the renal effector level while the RAAS principally controls sodium balance. Together these hormones tightly regulate serum sodium concentration. Managing hospitalized patients with DI/panhypopituitarism requires knowledge of the intricate interplay between ADH and thyroid/glucocorticoid tone to minimize the risk for dangerous sodium fluctuations. It is usually better to err on the side of mild hyponatremia than holding DDAVP in these complex patients which can lead to life threatening hypernatremia.

<http://dx.doi.org/10.1016/j.krcp.2012.04.573>

## 250 REFRACTORY TERTIARY HYPERPARATHYROIDISM AFTER CALCIMIMETICS AND DELAYED PARATHYROIDECTOMY IN A KIDNEY TRANSPLANT RECIPIENT

Ekamol Tantisattamo, David D. Ono

*Department of Medicine, University of Hawaii, Honolulu, Hawaii*

Persistent hyperparathyroidism affects renal outcomes and mortality. After kidney transplantation, cinacalcet is not approved as treatment for hyperparathyroidism. Parathyroidectomy, on the other hand, reverses electrolytes and mineral bone metabolism in almost all cases. Early parathyroidectomy may increase the chance of resolving hyperparathyroidism.

A 58-year-old man with ESRD status post deceased donor kidney transplantation 3 years prior presented with bone aches. He had persistent hypercalcemia and hypophosphatemia secondary to hyperparathyroidism. Serum calcium ranged 9.3–11.4 mg/dl and serum phosphorus was decreased with a lowest value of 2.1 mg/dl. Intact PTH level was elevated to 487 pg/ml and total 25-OH vitamin D was 20 ng/ml. Bone density studies indicated osteopenia. He refused parathyroidectomy and was treated with cinacalcet. Because of persistent hyperparathyroidism, he underwent subtotal parathyroidectomy. Postoperatively, he required high phosphorus diet, phosphate supplements, and cinacalcet to maintain normal serum phosphorus levels. Intact PTH was still elevated with the level of 188 pg/ml while he continued cinacalcet.

Normally, parathyroidectomy is performed 1 year posttransplantation unless severe bone disease, refractory hypercalcemia, or difficulty controlling phosphate wasting occurs. Phosphate wasting from hyperparathyroidism in our patient indicated parathyroidectomy; however, the surgery was delayed for 3 years while cinacalcet had been used. Post parathyroidectomy, hyperparathyroidism still persisted. Both cinacalcet and parathyroidectomy are imperfect to reverse hyperparathyroidism. Timely parathyroidectomy may determine the reversal of electrolyte and metabolic bone diseases; however, a delayed procedure may not have the same benefit. Since hyperparathyroidism is associated with higher incidence of kidney allograft dysfunction and postoperative mortality, should there be a level where pretransplant parathyroidectomy is performed?

<http://dx.doi.org/10.1016/j.krcp.2012.04.574>

## 251 WORSENING OF MALNUTRITION-INFLAMMATION SCORE IS ASSOCIATED WITH HIGH RATIO OF EXTRACELLULAR TO TOTAL BODY WATER IN

## HEMODIALYSIS PATIENTS

Narihito Tatsumoto, Hiroshi Tanaka, Shoji Tsuneyoshi  
*Hiroshima Red Cross Hospital & Atomic-bomb Survivors Hospital, Hiroshima, Japan*

The Malnutrition-Inflammation Score (MIS) has been reported to be associated with mortality in hemodialysis (HD) patients. Bioelectrical impedance analysis is useful for assessing the body fluid components. The purpose of this study is to evaluate the association between change in MIS and fluid components in HD patients. A total of 76 patients who were receiving a 5-hour HD, 3 times weekly, were enrolled in this study. MIS was performed every 6 months. Using IN BODY 720, body fluid components were estimated once a year, including intracellular water (ICW), extracellular water (ECW), total body water (TBW), total body fat, body fat percentage and ECW/TBW ratio. In univariate analysis, worsening of MIS was correlated positively with age and ECW/TBW ratio. In multivariate analysis, worsening of MIS was significantly associated with higher ECW/TBW ratio. Higher ECW/TBW ratio remained significantly correlated with worsening of MIS in non-obese HD patients, but not in obese patients. In conclusion, non-obese HD patients who has higher ECW/TBW ratio should be considered to be a risk group for malnutrition.

<http://dx.doi.org/10.1016/j.krcp.2012.04.575>

## 252 BENEFICIAL EFFECT OF KETO AMINO ACIDS FOR DIALYSIS PATIENTS

Vladimir Teplan<sup>1,2</sup>, Milan Hajek<sup>3</sup>, Milena Stollova<sup>1</sup>

<sup>1</sup>*Department of Nephrology, Transplant Centre, Institute for Clinical and Experimental Medicine, Prague, Czech Republic*

<sup>2</sup>*Institute for Postgraduate Medical Education, Prague, Czech Republic*

<sup>3</sup>*Department of Computed Tomography and Magnetic Resonance, Institute for Clinical and Experimental Medicine, Prague, Czech Republic*

Nutritional status is an important predictor of clinical outcome in dialysed patients. Beside decreased serum protein/albumin, lower BMI with decreased muscle mass is the most significant predictor of morbidity and mortality. Keto amino acids (KA) represent an additional source for protein anabolism influencing indirectly also carbohydrate and lipid metabolism, Ca-P and acid base balance. Additionally, by concomitant metabolic and hemodynamic effect on residual nephrons, KA can help to slow progression of residual renal function (RRF) mainly in peritoneal dialysis patients. We conducted a long-term prospective randomized placebo controlled trial to test whether a modified low-protein diet (LPD) with or without keto acids (KA) would be safe, well tolerated and associated with an increase of metabolic status and preservation of RRF in peritoneal dialysis (PD). We evaluated a total of 62 PD patients (32M/30F) aged 26–72 yrs with creatinine clearance (Ccr) 7.9–5.7 mL/min/1.73m<sup>2</sup> for a period of 12 months. All patients were on modified LPD containing 0.8 protein/kg/IBW/day and 135/kj/kg/IBW/day. LPD was randomly supplemented with KA at dosage of 100 mg/kg/IBW/day (30 patients, Group I) while 30 patients (Group II) received placebo. We analysed also muscle and fat metabolism by MR spectroscopy (MRS, m.tibialis anterior) and imaging (MRI, visceral fat). Patients from Group I were before enrolment on conservative management using LPD + KA (0.6g P + 0.1g KA/kg/IBW/day) for longer time (18–48 months, median 28) with good compliance (SGA). Patients from group II were never treated with LPD and KA. All patients were monitored at the beginning of PD and at every 3 months for 12 months. A neutral or positive long-term nitrogen balance (nPCR in g/kg IBW/day) was achieved in Group I (p < 0.05). RRF measured as Ccr remained stable in Group I (6.5 ± 2.18 to 5.9 ± 2.54 ml/min, p = NS), while it decreased in Group II (6.7 ± 2.22 to 3.2 ± 1.44 ml/min, p < 0.02). There were no differences in Dialysate clearance (DCcr (L/week/1.73 m<sup>2</sup>)). At the end of the study, there were significant differences in Total clearance per week expressed as Dialysate clearance + Residual creatinine clearance (TCcr = DCcr + RCcr), P < 0.01 and Total Kt/V<sub>urea</sub>/week, P < 0.01. Serum albumin increased significantly (from 29.5 ± 2.5 to 35.4 ± 3.4 g/L, P < 0.01) in Group I comparing to Group II (30.4 ± 3.4 to 31.8 ± 3.5 g/L, P = NS). Also urine output was significantly higher in Group I (1226 ± 449 mL/day) than in Group II (678 ± 327 mL/day, P < 0.01), respectively. Fat in muscle measured by MR spectroscopy (MRS, m.tibialis anterior) significantly decreased in Group I and was linked to reduced volume of visceral fat measured by MRI (p < 0.02). In conclusion, comparing to control Group II, long-term administration of modified LPD + KA was associated in Group I with better metabolic status and residual renal function (RRF, diuresis, Total clearance, Total Kt/V<sub>urea</sub>), S-albumin and nPCR). We confirmed positive changes in muscle mass and fat metabolism measured by MRS and MRI. Long-term administration of KA supplemented diet in dialysed patients was safe and well