The hyponatraemic hairdresser: highlighting the differentials

Dr William G Herrington MRCP a, Mohammad H Al-Mossawi BMBCh a, Ian S Roberts FRCPath b, Chris A O’Callaghan FRCP a,c

In May, 2008, an 18-year-old trainee hairdresser presented to her general practitioner with a 2-month history of weight-loss and polyuria. In response to comments from her peers about her weight, she had partially starved herself during the preceding week and consumed large volumes of soft drinks. There was concern about an eating disorder and blood tests were taken. However, before the results were available, she became confused and developed tonic-clonic seizures at home. She was intubated in the emergency department and transferred to the intensive care unit. Cranial imaging and lumbar puncture were normal, but her serum sodium was 99 mmol/L, creatinine 780 μmol/L, and creatine kinase 88 860 U/L. Paired serum and urine osmolalities were both low at 264 mOsmol/L and 242 mOsmol/L, respectively, with an inappropriately high urine sodium of 58 mmol/L. With continuous intravenous rehydration her sodium improved to 124 mmol/L, but her creatinine reached a plateau at 380 μmol/L. 3 weeks after admission, she was well and was discharged home. At her first nephrological review 1 week later she was dehydrated with postural hypotension, a serum sodium of 121 mmol/L and creatinine of 653 μmol/L. There was no medical or family history of kidney disease. She was underweight, with a body-mass index of 18 kg/m2. Her adrenal and thyroid function were normal. She had a normochromic anaemia, hyperphosphataemia, hyperparathyroidism, and low grade proteinuria. Her kidneys measured 8—9 cm on ultrasonography and were highly echogenic. Paired osmolalities again showed a dilute urine relative to plasma with a high urine sodium content. Despite rehydration there was no improvement in her blood or urine chemistry and haemodialysis was started. The differential diagnosis included resolving acute tubular damage from rhabdomyolysis or chronic renal failure with renal salt-wasting. Renal biopsy was consistent with nephronophthisis—part of the medullary cystic kidney disease complex (figure). There was no evidence of acute damage secondary to rhabdomyolysis. Her condition was stabilised on haemodialysis, and she was managed as an outpatient. When last seen in September, 2009, although on haemodialysis, her residual renal function means she continues to waste sodium; her serum sodium is between 125—130 mmol/L.
Renal biopsy

(A) Tubular atrophy and interstitial fibrosis with characteristic cystic dilatation of the remaining tubules (H&E stain, original magnification ×10). (B) Tubular basement membranes are thickened and multilayered (silver stain, original magnification ×40), with no evidence of acute tubular injury or myoglobin casts.

Nephronophthisis is the most common genetic cause of childhood end-stage renal failure. It can be caused by mutations in various genes including the NPHP genes which encode proteins involved in the function of cilia in renal tubules. Different mutations lead to presentations at different ages from infancy to adolescence. Progressive renal tubular cystic degeneration causes chronic renal failure and renal salt-wasting, often without hypertension. Our patient does not have mutations in her NPHP1 or NPHP3 genes so is likely to have a mutation in one or more of the many causative genes. Her initial episode of polydipsia on a background of chronic salt-wasting resulted in the presentation of extreme hyponatraemia causing seizures and rhabdomyolysis. Of note, eating disorders have been associated with chronic tubulointerstitial nephropathies and decreased concentrating ability. The syndrome of inappropriate anti-diuretic hormone secretion can also lead to low plasma osmolality and hyponatraemia, but urine osmolality is typically higher than plasma osmolality in this situation. Renal salt-wasting is an important and easily overlooked cause of hyponatraemia; extreme hyponatraemia—in the absence of diuretic therapy—is uncommon, even with an eating disorder. A salt-wasting nephropathy is an important differential diagnosis in this context. The treatment is fluid and salt supplementation rather than fluid restriction. A high urinary sodium (>20 mmol/L) is an easy screening investigation for a salt-wasting nephropathy.

Contributors
WGH, MHA and CAO'C managed patient/wrote report. ISR provided biopsy images and description. Written consent to publish was obtained from the patient.

References

a Oxford Kidney Unit, John Radcliffe Hospital, Headington Oxford
b Department of Cellular Pathology, John Radcliffe Hospital, Headington Oxford
c Nuffield Department of Clinical Medicine, University of Oxford, Headington, Oxford
Correspondence to: Dr William G Herrington, Oxford Kidney Unit, Churchill Hospital, Old Road, Headington, Oxford OX3 7LJ, UK