

Short reports

Status asthmaticus and the syndrome of inappropriate secretion of antidiuretic hormone

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Certain pulmonary disorders are known to be associated with the syndrome of inappropriate secretion of antidiuretic hormone (ADH), notably tuberculosis,¹ pneumonia,² and oat cell bronchial carcinoma.³ Although ADH levels have been measured in a small number of patients with status asthmaticus,⁴ no association between the clinical syndrome and severe asthma has previously been documented.

Case report

A 59-year-old housewife, a non-smoker, had been maintained for some years with salbutamol and beclomethasone aerosols for her asthma. She was admitted to hospital with a seven-day history of progressively worsening dyspnoea associated with marked wheezing, unrelieved by more frequent use of her inhalers, the addition of prednisolone (40 mg daily), and a dose of intravenous hydrocortisone (100 mg) given on the day of admission. There had been no fever, sputum, or any infective illness before her acute symptoms.

On examination she appeared mildly dehydrated and was severely dyspnoeic with poor chest expansion, reduced breath sounds, and widespread expiratory wheeze. Blood pressure was 140/90 with 20 mm Hg of paradox, and a sinus tachycardia of 120. Chest radiology revealed marked hyperinflation but no pneumothorax or infective changes. Blood gases on air demonstrated a P_{O_2} of 61 mm Hg (8 kPa), a P_{CO_2} of 54 mm Hg (7.2 kPa), and a pH of 7.34. Other investigations included a haemoglobin of 13.0 g/dl, white cell count of 10 000/mm³, sodium of 130 mmol/l, potassium of 4.1 mmol/l, and urea of 6.2 mmol/l.

The initial therapy included an infusion of hydrocortisone (2 g/24 hours in 2 litres of 5% dextrose), bolus doses of salbutamol (500 µg six hourly), nebulised salbutamol (5 mg four hourly), and oral prednisolone (40 mg/24 hours). Potassium supplements were given intravenously and orally at a rate of 86 mmol/24 hours.

Despite a transient improvement her peak flows remained at 50 l/min and over the next 72 hours she became progressively more confused and lethargic. A fluid intake of 2.5-3.0 litres daily did not increase the

urine output above 700 ml/24 hours, and she was found to have developed sacral and ankle oedema. The sodium had fallen to 110 mmol/l and the serum osmolality was 228 mOsm/kg (normal range 270-295 mOsm/kg) with a urine osmolality of 836 mOsm/kg. The potassium had risen to 6.0 mmol/l and the urine electrolytes revealed a sodium of 11 mmol/l, potassium of 120 mmol/l. The changes are illustrated in the figure.

The potassium supplements and intravenous salbutamol were stopped and fluid intake was restricted to 750 ml/24 hours. Seventy-two hours later the serum osmolality had risen to 270 mOsm/l, the sodium to 128 mmol/l, and the potassium had fallen to 3.5 mmol/l. In parallel with these electrolyte changes the patient became fully rational and orientated. However when the fluid intake was increased to 1.0-1.5 litres the serum osmolality fell to 260 mOsm/kg and the sodium remained at 128 mmol/l, a return to normal values of these measurements taking a further seven days with fluid restricted to less than 1.0 litre/24 hours. Eleven days after the start of fluid restriction the patient was able to take fluids freely with no further electrolyte changes.

During this period the patient's P_{O_2} rose to 80 mm Hg (11 kPa) and her peak flow rate increased to 250 litres/min, these figures representing the best obtainable.

Discussion

The clinical syndrome of inappropriate ADH secretion comprises dilutional hyponatraemia, a low serum osmolality with a paradoxically raised urine osmolality and, when measured, raised ADH levels in serum. These biochemical features account for the common signs of lethargy, confusion, coma, and convulsions. One study exists of patients with status asthmaticus who exhibited raised levels of ADH.⁴ No details were given of the clinical state of the patients and although serum osmolalities ranged from 256 to 276 mOsm/kg, the sodium levels remained between 136 and 139 mmol/l and the urine osmolalities were not stated. The study of the patients, with one exception, was confined to the first 24 hours of hospital treatment when fluid intake exceeded output by 200-900 ml except for one patient who had an excess of 2 litres. As mild degrees of dehydration cannot be discounted in such patients the fluid balance and biochemical findings could be explained on these grounds.

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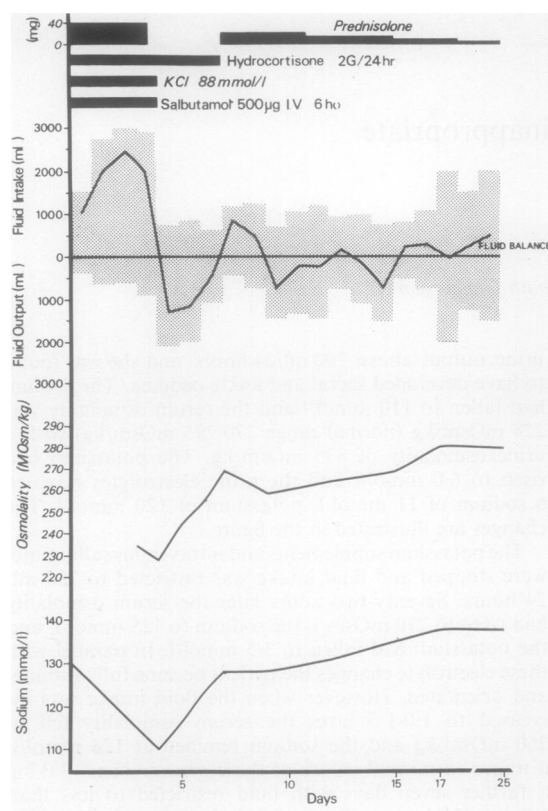


Figure Details of fluid balance, serum sodium, and osmolality, showing the progress and treatment of the various electrolyte disturbances.

Our patient satisfied the criteria for diagnosis of inappropriate secretion of ADH, and responded to the established treatment. Several features are noteworthy in this unusual presentation. Large volumes of fluid are given to patients in status asthmaticus, usually intravenously, because of variable degrees of dehydration on admission and a temporary inability to maintain an adequate intake because of severe dyspnoea. Thus although this practice is unlikely to precipitate the clinical syndrome of inappropriate ADH secretion, any tendency to retain fluid, as has been demonstrated in patients with chronic bronchitis,⁵ could be aggravated

to the extent of producing symptoms. Administration of the beta-agonist salbutamol intravenously may have stimulated ADH secretion as isoprenaline does,⁶ an effect which cannot be dismissed in this patient. Finally the syndrome could have arisen as a direct consequence of the severe asthmatic state itself, possibly caused by reduced left atrial pressure as a result of deranged pulmonary blood flow.

Corticosteroid therapy used in status asthmaticus may have a protective effect on the effects of inappropriate antidiuretic hormone secretion as these drugs raise the threshold of secretion of ADH.⁷ A similar clinical syndrome of oedema and severe dyspnoea without inappropriate ADH secretion has also been described after infusion of a β stimulant and corticosteroids in premature labour although in this patient there may have been an underlying cardiomyopathy.⁸

This report of a patient in status asthmaticus accompanied by the syndrome of inappropriate secretion of ADH indicates that care should be exercised when infusing large volumes of fluids and beta-receptor agonists such as salbutamol in severe asthma.

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