should be preceded by an ECG to exclude those patients with atrioventricular block grades II and III.

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Sulphamethoxazole, hypoalbuminaemia, crystalluria, and renal failure

Sulphamethoxazole is an active component of co-trimoxazole. We describe two patients who developed renal failure after receiving this drug.

Case reports

Case 1—A 31-year-old woman developed generalised peritonitis secondary to a pyosalpinx, which had been excised. Endotoxic shock ensued, which was treated with penicillin, gentamicin, and metronidazole for seven days with good effect. She then became febrile and was started on co-trimoxazole intravenously, 1 ampoule (5 ml co-trimoxazole in 150 ml 0·9% saline) infused over 30 minutes. The drug was given 12-hourly, and within 36 hours her urine output had fallen in association with haematuria and profound crystalluria. Co-trimoxazole was stopped but she went into complete renal failure and, despite acute haemodialysis, died.

Case 2—A 24-year-old man presented with peritonitis eight days after being stabbed in the abdomen causing three colonic perforations, which had been oversewn. He was given the same antibiotics as in case 1, but with little effect, and intravenous co-trimoxazole was begun (same regimen as in case 1). Within 48 hours he went into acute renal failure. Mannitol (20%) 300 ml was administered and co-trimoxazole stopped. This resulted in a pronounced diuresis, and within 14 days renal function returned to normal.

Comment

Both these patients were septicaemic and hypoproteinaemic (serum albumin concentrations 16 and 18 g/l respectively). In both cases serum samples taken before co-trimoxazole treatment were recovered, which permitted in-vitro sulphamethoxazole-binding studies using ^{35}C-sulphamethoxazole. With normoalbuminaemic serum 24-35% of sulphamethoxazole is protein bound.[1] In these two patients, however, only 2% and 3·6% of the drug was bound. Neither patient was dehydrated when co-trimoxazole was instituted, and in both cases renal function was normal (serum creatinine 97·2 and 79·6 μmol/l (1·1 and 0·9 mg/100 ml) respectively). Presumably by virtue of the hypoalbuminaemia, and possibly due to the presence of penicillin and metronidazole in the serum acting as competitive binders, sulphamethoxazole was unable to bind, so that nearly all the drug was free (unbound). This is a similar finding to that reported in kwashiorkor serum, in which only 4·7% of the drug was bound (serum albumin 22 g/l).[1]

As only the free component of a drug is filtered by the kidneys it may be assumed that in these two patients crystalluria ensued secondary to the massive load of free drug. Hence co-trimoxazole should probably be used with circumspection in hypoalbuminaemic patients. If it is essential to use the drug, the dosage should be decreased, the dosage frequency increased, and great care paid to fluid therapy.

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SHORT REPORTS

Stimulated sweating in chronic renal failure

Concentrations of urea and potassium in the sweat of normal subjects and patients with chronic renal failure (CRF) are higher than serum concentrations.[1-3] Water loss from the skin may exceed two litres per hour in hot environments.[2 4 5] It would therefore be interesting to examine the extent to which stimulated sweating in patients with CRF could compensate for loss of renal function. We describe a patient on chronic intermittent haemodialysis who was used to taking sauna baths. Serum concentrations of urea and potassium were low and weight gain between haemodialysis sessions was small compared with those of other patients undergoing intermittent haemodialysis. Losses of urea, potassium, and water in sauna and hot baths[5] were measured to investigate whether they could account for the observed low serum concentrations of these substances and for the stable fluid balance in this patient.

Patient, methods, and results

A 52-year-old anuric man started to take sauna baths three times a week on days when he was not undergoing dialysis six months before our study. Before the sauna baths the patient took a lukewarm shower and brushed his skin to remove formerly excreted solids. The air temperature in the sauna was 70°C, and he bathed for one to two hours. After each sauna bath his body weight decreased by 1·5-2 kg. During the study the sweat that dripped from his bended head while in the sauna was collected in 20-ml samples, and total losses of urea and potassium were calculated from weight loss and sweat concentrations. The patient was also studied in hot water baths of 42°C.[5] He was immersed in water up to his neck in an impermeable plastic bag, which contained 20 litres of distilled water. Fluid from the bag was sampled before and after the baths and duplicate 1-litre portions were concentrated tenfold by distillation. This permitted us to calculate more accurately the total loss of urea and potassium than in the sauna bath.

The figure shows predialysis serum concentrations of urea and potassium in the patient and in 16 controls on chronic intermittent haemodialysis. Results were corrected for differences in dietary intake related to body weight. After six months serum urea and potassium concentrations were significantly lower in the patient than in the controls ($P < 0·001$; t-test). The sweat to serum urea ratio was 2·0 in two sauna baths and 1·8 in two hot water baths. Sweat to serum potassium ratio was 2·5 for both sauna and hot water baths. Sweat rates in sauna and hot water baths were 21 and 33 ml/min respectively. Urea clearances in hot water baths were therefore higher than in sauna baths—56 and 40 ml/min respectively. Calculated losses of urea and potassium in sweat were 43 and 12 mmol/h (2·6 g/h and 12 mEq/h) compared with 117 and 20 mmol/h (7·0 g/h and 20 mEq/h) by haemodialysis. Total excretion of urea and potassium in sweat averaged 215 and 60 mmol/week (12·9 g/week and 60 mEq/week) respectively, which amounted to 19% and 30% of the total quantity removed by haemodialysis. These figures fully explain the observed falls in serum concentrations of urea and potassium of 23% and 35% respectively.

Comment

These findings indicate that stimulated sweating can be used as a valuable adjunct to chronic intermittent haemodialysis. In our patient a 30-minute hot water bath every day was as effective as a two-hour sauna bath three times a week. In patients with CRF control of fluid