SYMPTOMATIC HYPONATREMIA FOLLOWING NITROPRUSSIDE THERAPY

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INTRODUCTION

Sodium nitroprusside has proved to be a reliable and effective agent for acutely lowering blood pressure in hypertensive crises.[1,2] Given this agent's profound circulatory effects, it is possible that altered sodium and water handling might result with its use. We report a patient who developed acute symptomatic hyponatremia following intravenous nitroprusside infusion on two consecutive occasions for control of accelerated hypertension.

CASE SUMMARY

This was a 63 year old female with a 20-year history of hypertension who presented to an outside hospital with headaches, right-sided abdominal pain, nausea and vomiting. She had been in her usual state of health with reasonable control of blood pressure receiving Combipres 0.3 mg/daily until one week prior to admission when her symptoms began. On admission, her blood pressure was noted to be 240/130. Physical examination was essentially unremarkable except for marked arteriolar narrowing of retinal vessels and mild epigastric tenderness. There were no neurological deficits nor any signs of heart failure. Admission laboratoy data revealed a hematocrit of 45% with serum sodium 132 mEq/l, serum potassium 2.7 mEq/l, serum chloride 100 mEq/l and serum bicarbonate of 24 mEq/l. A BUN and creatinine were within normal limits with a urine specific gravity of 1.012. The remainder of her general blood chemistry panel was essentially normal. The chest x-ray showed a normal size cardiac silhouette with no evidence of active cardiopulmonary disease. The electrocardiogram was unremarkable. She was started on continuous sodium nitroprusside infusion at 3-4 mcg/Kg/min which resulted in a prompt lowering of her blood pressure from 240/130 to 150/90 in the first twelve hours. During the first 72-hour period, the serum sodium dropped from 133 mEq/l to 119 mEq/l (see figure 1, period 1) with the patient becoming confused and less responsive. Fluid restriction was enforced with a correction of her serum sodium to 132 mEq/l over the next few days. Because of an inability to wean the patient off her nitroprusside infusion, she was transferred to our hospital on the seventeenth hospital day.

On admission to UCSF, the blood pressure was 200/100 with the patient having been off the nitroprusside infusion for approximately eight hours. Fresh hemorrhages were seen on funduscopy with an otherwise unremarkable physical examination. The serum sodium was 133 mEq/l, potassiu, 2.9, chloride 89, and a total bicarbonate 29 mEq/l. The BUN was 11 mg% with a serum creatinine of 0.9 mg%. The admission SMA-12 was within normal limits and the chest x-ray and the electrocardiogram were similarly unremarkable. Thyroid and adrenal functions were normal. Two twenty-four hour VMA tests were normal. The patient was restarted on a continuous nitroprusside infusion at 3-4 mcg/Kg/min. Over the next 72 hours, the serum sodium again fell from 133 mEq/l to 119 mEq/l (figure 1, period 11) with her blood pressure dropping to 100/70 at the lowest. The patient again became disoriented, confused and complained of headaches. Hypertonic sodium chloride (514 mM) infusion was immediately begun with a correction of the serum sodium to 132 mEq/l over the next 36 hours. Her neurologic symptoms ameliorated. Over the next three to four days, a satisfactory control of blood pressure was achieved with oral medications which included Inderal, Dibenzyline and Hydralazine. The nitroprusside was eventually discontinued. No further hyponatremia was noted despite a later period of a positive fluid balance.

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DISCUSSION

The development of severe, symptomatic hyponatremia was temporarily associated with two consecutive administrations of nitroprusside. This occurred concomitantly with acute reductions in systemic blood pressure. There were no clinical signs of dehydration or, alternatively, of congestive heart failure. A temporary drug-induced sequence which led to an impaired ability to handle a water load is evidence by: (1) a net positive fluid balance on both occasions, (2) the consecutive hyponatremic episodes following nitroprusside, (3) the low-measured urinary sodiums (ruling out renal salt-wasting), and (4) a restoration of renal diluting capability once the nitroprusside had been discontinued. The renal function remained normal throughout the observation.

It is now well recognized that ADH release may be influenced by osmotic and non-osmotic stimuli.[3] Left atrial receptors, which are low-pressure receptors, modulate ADH-release through the vagus nerve. Shu'ayb demonstrated a significant increase in plasma ADH levels following release of distended left atrial balloons in dogs.[4] This was associated with a reduction in urine flow and could be abolished by vagotomy. D'Angelo, in a review of water and electrolyte disturbances which follow mitral cimmissurotomy, described five patients who developed dilutional hypernatremia with serum sodiums falling between 7-20 mEq/l.[5] This dilutional hyponatremia was associated with post operative oliguria after correction of long standing mitral stenosis.

Since the major hemodynamic changes induced by nitroprusside[6] are reflected by a fall of arterial pressure, a decrease in left atrial and left ventricular pressure with a rise in cardiac output, it is conceivable that sodium nitroprusside infusion in this individual, with markedly elevated arterial pressures, produced a potent non-osmotic stimulus for ADH release by acutely lowering left atrial pressure relieving left atrial distension. The dilutional hyponatremia occurring in our case following nitroprusside administration on two occasions might have had as its cause a mechanism similar to that of the post commissurotomy syndrome.

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