CRITICAL CARE

LETTER

Management of sodium disorders during continuous haemofiltration

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Abstract

In patients with acute kidney injury and concomitant severe hyponatraemia or hypernatraemia, rapid correction of the serum Na^+ concentration needs to be avoided. The present paper outlines the principles of how to adjust the Na^+ concentration in the replacement fluid during continuous renal replacement therapy to prevent rapid changes of the serum Na^+ concentration.

Introduction

Continuous venovenous haemofiltration (CVVH) is an established treatment for patients with acute kidney injury. During CVVH, serum electrolyte concentrations tend to equilibrate with their concentrations in the replacement fluid. The rate at which this happens depends on the difference in their concentrations between serum and replacement fluid, and on the rate of treatment.

Patients presenting with acute kidney injury may have concomitant severe hyponatraemia or hypernatraemia. Over-rapid correction of the serum Na^+ concentration is associated with pontine myelinosis and/or cerebral oedema [1,2]. If CVVH is needed, the Na^+ concentration in the replacement fluid (usually 140 mmol/l) needs to be adjusted in order to avoid rapid changes of the serum Na^+ concentration. In the present paper we provide some guidance on how to make these adjustments for CVVH. The same principle could be applied for continuous haemodialysis or diafiltration.

Acute kidney injury and hypernatraemia (Na^+ >155 mmol/l)

Free water hydration is the first-line therapy if possible. If CVVH is necessary, the Na^+ concentration of the replacement fluid should be increased by adding concentrated NaCl solution (Table 1).

Generally, it is not considered safe to lower the serum Na^+ concentration by more than 8 to 10 mmol/l over 24 hours, especially in the setting of chronic hypernatraemia [1]. Usually, a stepwise correction of the patient's serum Na^+ concentration is planned using replacement fluid made up to successively lower Na^+ concentrations.

If the serum Na^+ decreases by >2 mmol/l in 6 hours, either the rate of filtration should be decreased or the fluid bags should be changed to bags with a higher Na^+ concentration.

The volumes of 30% NaCl added are small and will not affect the concentration of other electrolytes in the solution significantly.

Acute kidney injury and hyponatraemia (Na^+ <125 mmol/l)

If CVVH is needed, the Na^+ concentration of the replacement fluid should be reduced by adding sterile water (Table 2). Generally, it is not considered safe to increase the serum Na^+ concentration by more than 8 to 10 mmol/l over 24 hours, especially in chronic hyponatraemia [2]. Usually, a stepwise correction of the patient's serum Na^+ concentration is planned using replacement fluid made up to successively higher Na^+ concentrations.

If the serum Na^+ concentration has increased by >2 mmol/l in 6 hours, either the rate of filtration should

Table 1. Effect of adding different volumes of 30% NaCl to replacement fluid

Volume of 30% NaCl added	Nil	5 ml (=25 mmol Na^+)	10 ml (=50 mmol Na^+)	15 ml (=75 mmol Na^+)	20 ml (=100 mmol Na^+)
Final Na^+ concentration in replacement fluid	140 mmol/l	145 mmol/l	150 mmol/l	155 mmol/l	160 mmol/l

Effect of adding different volumes of 30% NaCl (≈5 mmol/ml) to a 5 l bag of replacement fluid containing a Na^+ concentration of 140 mmol/l.

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Table 2. Effect of adding different volumes of water to replacement fluid

Volume of water added (ml)	Final volume of diluted replacement fluid (l)	$[Na^+]$ in diluted replacement fluid (mmol/l)	$[HCO_3^-]$ in diluted replacement fluid (mmol/l)	$[K^+]$ in diluted replacement fluid containing 4 mmol/l
Nil	5	140	35	4.0
150	5.15	136	34	3.9
250	5.25	133	33	3.8
350	5.35	131	33	3.7
500	5.5	127	32	3.6
750	5.75	122	30	3.5
1,000	6.0	117	29	3.3
1,250	6.25	112	28	3.2

Effect of adding different volumes of water to a 5 l bag of replacement fluid with a Na^+ concentration of 140 mmol/l. $[Na^+]$, sodium concentration; $[HCO_3^-]$, bicarbonate concentration; $[K^+]$, potassium concentration.

be decreased or the fluid bags should be changed to bags with a lower Na^+ concentration.

The concentration of bicarbonate and potassium in the final solution will also be reduced, and the patient may need additional supplementation.

Abbreviations

CVVH, continuous venovenous haemofiltration.

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Competing interests

The authors declare that they have no completing interests.

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