Case Report

Use of Hypertonic Continuous Venovenous Hemodiafiltration to Control Intracranial Hypertension in an End-Stage Renal Disease Patient

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Continuous venovenous hemodiafiltration (CVVHDF) using solutions designed to maintain hypernatremia is described in an end-stage renal disease (ESRD) patient with cerebral edema (CE) due to an intracerebral hemorrhage (ICH). Hypernatremia was readily achieved and maintained without complication. CVVHDF should be considered as an alternative treatment option in ESRD patients with cerebral edema who require hypertonic saline therapy.

1. Introduction

Osmotherapy is an option for the treatment of cerebral edema due to acute brain injury. It is used to prevent progression of CE and lower intracerebral pressure (ICP). Mannitol and hypertonic saline (HTS) are the drugs currently available for this purpose [1]. Mannitol would be inappropriate in a patient with end-stage renal disease (ESRD) due to its accumulation in a patient without excretory function. Hypertonic saline would be acceptable only as long as its accumulation and the excess extracellular volume generated by the resulting hypertonicity could be controlled. A patient with ESRD is described who developed an ICH with subsequent CE and was placed on continuous venovenous hemodiafiltration (CVVHDF) using fluids specially designed to maintain a hypertonic state with goal serum sodium of approximately 150–155 meq/L.

2. Case Report

The patient is a 45-year-old male admitted after developing a headache, slurred speech, and left hemiparesis during his routine hemodialysis treatment. A CT scan of the brain showed a $4.4 \times 2.5$ cm area of hyperattenuation in the right basal ganglia area, moderate edema associated with the ICH, and mass effect with a 2 mm right-to-left midline shift. His admission serum sodium was 139 meq/L. He had been on hemodialysis for the past 7 to 8 years. He was known to be hepatitis C antibody and hepatitis B antigen positive. He also had a history of hypertension and asthma. The day after admission a repeat CT scan demonstrated that the edema and mass effect had increased and that the midline shift had increased to 10 mm. Because of compression on the third ventricle, mild hydrocephalus had also developed. A ventriculostomy catheter was inserted the day after admission. That same morning, he was started on continuous venovenous hemodiafiltration (CVVHDF) using regional citrate anticoagulation. Our standard CVVHDF protocol is based on that of Mehta et al. [2] but uses a fixed rate of citrate. The standard protocol has a dialysate sodium of 117 meq/L and a predilution replacement fluid sodium of 135 meq/L. This was adjusted to a dialysate sodium of 127 meq/L and a predilution replacement fluid sodium of 155 meq/L. In addition, shortly after the initiation
3. Discussion

Osmotherapy is an effective treatment option to control CE and reduce and maintain pressure in patients with acute brain injury. Mannitol and HTS are the usual drugs used, both can have significant side effects. Mannitol has been reported to cause metabolic acidosis and increase cerebral edema requiring replacement therapy, due to greater cardiovascular and intracranial stability, is the preferred method to treat patients with acute brain injury and renal failure [9]. We treated our patient with CVVHDF using specifically prepared solutions.

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