Hypernatremia

Hypernatremia, is a high concentration of sodium in the blood. Normal serum sodium levels are 135 – 145 mmol/L (135 – 145 mEq/L). Hypernatremia is generally defined as a serum sodium level of more than 145 mmol/L.

Hypernatremia is one of the most common electrolyte disturbances following aneurysmal subarachnoid hemorrhage (aSAH) and has been correlated with increased mortality in single institution studies. Both hyponatremia and hypernatremia during ICU management were significantly associated with unfavorable neurologic outcomes [1].

In neurosurgical patients, this is most often seen in the setting of diabetes insipidus (DI). Since normal total body water (TBW) is ≈ 60% of the patient's normal body weight, the patient's current TBW may be estimated by Eq.

Mild and moderate hypernatremia were significantly associated with increased early mortality in patients with severe TBI [2]. Hypernatremia was associated also with poorer outcomes in patients with severe TBI. This finding warrants further investigation in a prospective, randomized study [3].

Electrolyte imbalances are common in traumatic brain injury. In a study Hypokalemia was the most common electrolyte imbalance at 65.5%. The results of the use of a multivariable logistic regression model showed that the odds of postoperative death in TBI patients were increased with high levels of blood glucose, hypernatremia, and acidosis.Hypokalemia was the most common electrolyte imbalance in TBI patients. Hypernatremia, acidosis, and hyperglycemia significantly increased the odds ratio of death in the first 24 hours post TBI [4].

Clinical features

Early symptoms may include a strong feeling of thirst, weakness, nausea, and loss of appetite.

Severe symptoms include confusion, muscle twitching, and bleeding in or around the brain.

Severe symptoms typically only occur when levels are above 160 mmol/L.

Treatment

The free water deficit to be replaced is given by a Eq. Correction must be made slowly to avoid exacerbating cerebral edema. One half the water deficit is replaced over 24 hours, and the remainder is given over 1–2 additional days. Judicious replacement of deficient ADH in cases of true DI must also be made.

The aim of a work of Vassilyev was to evaluate the effectiveness of Sterofundin in the framework of complex therapy of hypernatremia in neurosurgical patients after removal of brain tumors. They analyzed the dynamics of the concentrations of sodium, potassium, chorus of the plasma, anion gap

and buffer bases in the postoperative period of these patients. For obtaining reliable results, the patients were divided into groups according to the nature of the treatment: Sterofundin and symptomatic correction of hypotonic solution of sodium chloride, saluretic and Spironolactone respectively. In a comparison between the groups, a distinct difference in the speed of regression of hypernatremia and durability of the achieved effect was observed. In case of treatment with Sterofundin there was a significant decrease of hypernatremia by the end of the second day of the postoperative period without tendency to re-raise. The prevalence of hypotonic solutions of sodium chloride and potassium-sparing saluretics in intensive care allowed reducing the sodium concentration non-persistently to the fourth day on the background of significant fluctuations in its concentration. The use of Sterofundin in complex therapy of electrolyte disturbances, particularly of hypernatremia in neurosurgical patients after removal of brain tumors, is reflected in the form of significant regression of increased sodium concentration in plasma compared with the method of use “hypotonic” hemodilution, saluretics and potassium-sparing diuretics [5)].

Complications

Coma.

Pulmonary complications and acute kidney injury were more common in hypernatremia [6)].

Hoffman et al., from the Upstate Medical University performed a retrospective analysis of adults between 2002 and 2011 with a primary diagnosis of aneurysmal subarachnoid hemorrhage (aSAH) using the Nationwide Inpatient Sample (NIS). Patients were grouped according to whether or not an inpatient diagnosis of hypernatremia was present. The primary outcome was the NIS-SAH outcome measure. Secondary outcomes included in-hospital mortality, length of stay (LOS), and non-routine hospital discharge. Outcomes analyses adjusted for SAH severity using the NIS-SAH Severity Score, Charlson Comorbidity Index, and the presence of cerebral edema.

A total of 18,377 patients were included in the study. The incidence of a poor outcome as defined by the NIS-SAH outcome measure was 65.9% in the hypernatremia group and 33.4% in the normonatremia group (OR 1.96, 95% CI 1.68 - 2.27). There was higher mortality in the hypernatremia group (OR 1.60, 95% CI 1.37 - 1.87). Patients with hypernatremia had a significantly higher rate of non-routine hospital discharge and gastrostomy. The incidences of poor outcome, in-Hospital mortality, and non-routine disposition were higher in the hypernatremia group regardless of treatment type (clipping vs. endovascular embolization). Pulmonary complications and acute kidney injury were more common in the hypernatremia group as well.

In patients with aSAH, hypernatremia is associated with poorer functional outcomes regardless of SAH severity [7)].

References

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