LETTERS TO THE EDITOR

Postoperative hyponatremia

TO THE EDITOR: We read with great interest the article by Williams et al. on postoperative hyponatremia (Williams CN, Riva-Cambrin J, Bratton SL: Etiology of postoperative hyponatremia following pediatric intracranial tumor surgery. J Neurosurg Pediatr 17:303–309, March 2016).

We congratulate the authors, as they present the largest cohort to date of pediatric patients with hyponatremia after surgical treatment of brain tumors.

We agree with the authors that the syndrome of inappropriate antidiuretic hormone secretion (SIADH) and cerebral salt wasting (CSW) have been reported among patients with pediatric intracranial tumors and other lesions. However, these studies have not completely evaluated the patient characteristics associated with SIADH versus CSW in children following neurosurgery.

This is an issue of great interest because hyponatremia is known to develop—sometimes surprisingly—in children after neurosurgical procedures of relatively low complexity, such as shunt placement or endoscopic ventriculostomy. Moreover, the development of postoperative hyponatremia is not limited to specific tumor locations or histological types. We would like to suggest that the number of patients affected might be higher than suspected. The authors report a rate of 12%, but in our opinion, this complication can be more frequent.

The authors assessed, as potential causes of hyponatremia, intravenous fluid type and amount, medications, dilutional hyponatremia, hyperosmolar hyponatremia, hypo-volemic hyponatremia from vomiting or diarrhea, adrenal insufficiency, hypothyroidism, CSW, and SIADH. Tumor locations, presence of metastases, histological findings, hydrocephalus, and existence of stroke were reviewed. Infectious complications, such as pneumonia, bacteremia, meningitis, and urinary tract infections, were also included for analysis.

However, the authors were not able to identify differences with respect to tumor locations and histology. They argue that perhaps the low number of patients may be the cause for the lack of statistically significant results. When reviewing our own series, the conclusions are similar.

Currently, our group is working on a different approach to the problem of hyponatremia in the pediatric neurosurgical patient. We think that this approach can complement the investigation of the causes of development and type of hyponatremia described by the authors in their paper.

Specifically, we are evaluating at this time whether mechanical or anatomical displacement of the hypothalamus may be, together with the above-described potential causes, considered as a major cause in the development of hyponatremia in these patients, as well as a factor affecting its type and duration.

Large supratentorial lesions displacing the hypothalamus and tumors of the third ventricle and hydrocephalus with extreme dilation of the third ventricle are more common in children. In fact, these lesions tend to be seen in very young children. Moreover, posterior fossa lesions and tumors remote from the hypothalamus are frequently accompanied by enlargement of ventricles, including the third ventricle.

We hypothesized that the mechanical displacement of the hypothalamus—rather than lesion histology or location—would be a cause to consider. In young children these displacements may be substantial, even by centimeters. The severity and type of hyponatremia may also be related to the anatomical recovery.

We are now reviewing our own cases with a view to this hypothesis, and as shown in Fig. 1, the correlation with hyponatremia is very clear. To date, we have identified diverse patterns of response to displacement recovery that are summarized in the figure. In essence, severe hypothalamic displacement implies severe and prolonged changes in electrolyte balance. The correction is very complex, and hyponatremia can alternate with hypernatremia. When displacement is not severe, as in the treatment of lesions of the third ventricle, the sodium anomalies are typically not severe or long-lasting.
FIG. 1. Examples of changes in plasma sodium level (mEq/L) and their relation with hypothalamic displacement. Preoperative and postoperative Gd-enhanced T1-weighted MR images obtained at the hypothalamic level in 6 different patients are shown along with graphs of changes in the patients’ plasma sodium levels.  

A and B: Postoperative (left) and preoperative (right) coronal MR images showing severe displacement in a patient with a low-grade third-ventricle glioma (A) and a patient with a third-ventricle craniopharyngioma (B).  

C: Postoperative (left) and preoperative (right) coronal MR images showing moderate displacement in a patient with severe hydrocephalus due to shunt malfunction after craniopharyngioma surgery.  

D: Postoperative (left) and preoperative coronal (center) and sagittal (right) MR images showing mild displacement in a patient with a posterior third-ventricle lesion (atypical teratoid rhabdoid tumor).  

E: Postoperative (left) and preoperative coronal (center) and sagittal (right) MR images showing minimal displacement in a patient with a posterior fossa medulloblastoma. Figure is available in color online only.