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## Annals of Internal Medicine LETTERS

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### Postoperative Hyponatremia

*To the Editor:* We read with interest the study by Steele and colleagues (1) suggesting that near-isotonic fluid infusion could decrease the plasma sodium level in postoperative patients. They have thus confirmed that the phenomenon in which volume expansion in persons with elevated plasma antidiuretic hormone levels results in a substantial quantity of infused NaCl excreted in the urine (2) also applies to persons who have just had surgery. However, these findings should not suggest that infusion of isotonic (154 mmol of NaCl per L) can lead to postoperative hyponatremic encephalopathy. Among 158 postoperative patients with hyponatremic encephalopathy studied at our laboratory and 31 additional patients described between 1935 and 1990, not 1 patient was given isotonic NaCl (3). Three were given Ringer lactate solution (130 mmol of sodium per L).

Steele and colleagues showed a mean decline in plasma sodium level of only 4 mmol/L, not a dangerous level (1). Of note, all patients in this study who developed fatal hyponatremic encephalopathy received hypotonic fluid after surgery. The authors have confirmed our previous finding that brain damage from postoperative hyponatremic encephalopathy occurs primarily in women of childbearing age, particularly after gynecologic surgery (4). Equally important, however, is the fact that these authors have confirmed that in this susceptible population, plasma sodium levels as high as 126 mmol/L can be fatal. It should be pointed out that hyponatremic encephalopathy may occur not only when the hypotonic fluid is administered intravenously but also when it is absorbed by way of the uterine lining during endoscopy-assisted vaginal hysterectomy (5). In summary, although administration of near-isotonic fluid may lead to a modest decrease in plasma sodium level, clinicians should be aware that the routine use of hypotonic fluids in postoperative patients should be avoided.

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*In response:* Ayus and Arieff's letter deserves clarification on three points. First, can the plasma sodium level decrease to 120 mmol/L if only isotonic saline was infused? It is universally agreed that severe hyponatremia must be avoided immediately after surgery. Anything that adds electrolyte-free water (for example, hypotonic infusions or desalination of isotonic saline) when antidiuretic hormone acts contributes to the degree of hyponatremia and should be minimized. Moreover, the amount given relative to body size is important. A calculation might help here. Almost 15% of total body water must be retained as electrolyte-free water to cause the plasma sodium level to decrease to 120 mmol/L. If isotonic saline were the sole fluid given to a patient with 25 L of total body water (50 kg, 50% water), one must "desalinate" 8 L (the volume infused in our patients was as high as 10 L); much less is needed with a smaller volume of total body water. Finally, a wrong impression is gleaned from an analysis of only mean values: Two patients had a plasma sodium level of 131 mmol/L, but no one had expected this decrease because no electrolyte-free water had been given.

The second point concerns the relation between sex and incidence of fatal outcome from our data. Because the index cases of acute encephalopathy represent highly selected data, we would rather not draw conclusions about the association between poor outcome and sex from such data.

The third point concerns the degree of hyponatremia needed to cause death. With the index cases, one must be cautious when interpreting the degree of hyponatremia needed to induce fatal hyponatremic encephalopathy. We do not know whether the measured plasma sodium level represented the nadir of the hyponatremia in these patients. Other processes could cause a sudden increase abruptly with a seizure (1), and central diabetes insipidus can develop with brain herniation (time with the true nadir of plasma sodium level causing large water diuresis. If blood sampling is delayed, one might now correlate the syndrome with an artificially higher plasma sodium level. Accordingly, we were not certain of the nadir value for natremia in these patients.

In summary, although we agree that routine use hypotonic fluids in the postoperative period should be avoided, it is important to be aware that a significant degree of hyponatremia can and does occur in selected patients treated with isotonic saline in this setting.

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