Learning From Others:

A Case Report From the Anesthesia Incident Reporting System

Anesthesia Quality Institute
ANESTHESIA INCIDENT REPORTING SYSTEM (AIRS)

Detailed review of unusual cases is a cornerstone of anesthesiology education. Each month, the AQI-AIRS Steering Committee will abstract a case and provide a detailed discussion based on a submission to the national Anesthesia Incident Reporting System. Feedback regarding this item can be sent by email to ***r.dutton@asahq.org****. Report incidents to* ***www.aqiairs.org****.*

Case 2011-3: Intraoperative Hyponatremia

A 72-year-old man presented to the O.R. for a transurethral resection of the prostate (TURP). His past medical history was significant for morbid obesity, benign prostatic hyperplasia and intermittent hematuria. He had undergone 11 cystoscopic bladder evacuations and fulgurations in the previous year. Uneventful spinal anesthesia was complicated by steadily increasing patient discomfort after two hours of surgery. General anesthesia was induced, a laryngeal mask airway was placed, and the procedure was continued with the patient breathing spontaneously. The procedure lasted for 5 hours, and more than 80 L of sterile water irrigation was used. An increasing rate of premature ventricular contractions (PVCs) on the monitor was noted intraoperatively and correlated with a decrease in serum sodium to 115 mEq/L. The irrigation fluid was switched to glycine and 20 mg of furosemide was administered intravenously. A repeat measurement of sodium at the end of the case revealed a value of 112 mEq/L.

Discussion

Operative cystoscopic procedures typically require continuous irrigation with a transparent, non-conductive fluid to allow the surgeon to see the prostate or bladder and electrically excise or cauterize it. Similar considerations apply to operative hysteroscopic procedures in women. Several fluid types are used for this irrigation, including distilled water and dilute solutions of glycine, mannitol or sorbitol. Systemic absorption of any of these solutions can lead to complications. "TURP Syndrome" is characterized by electrolyte abnormalities (hyponatremia, hypoosmolarity, hemolysis, hyperglycinemia) leading to cardiovascular symptoms (dysrhythmia, pulmonary edema, hypertension, shock), neurologic symptoms (nausea and vomiting, confusion, agitation, seizure, blindness, coma) and eventual hemodynamic collapse. The pathophysiology of this syndrome arises from rapid hemodilution with a hypoosmolar solution. Longer procedures and increased intraoperative bleeding are associated with an increased need for irrigating fluid and a higher irrigating pressure; both of these variables are associated with an increased risk. TURP syndrome does not predictably develop at any absolute level of irrigation or hyponatremia and has been described even after short and uneventful procedures. Increased cerebral edema and progressive cardiovascular instability are typically observed with sodium levels below 120 mEq/L. The physiologic response to hyponatremia depends on whether osmolarity is preserved (as with glycine or sorbitol solutions vs. distilled water) and on the rate at which serum sodium changes.

In the case presented it is clear that a significant quantity of irrigation fluid was absorbed, but the clinical symptoms were relatively mild. This may be due to the time course of absorption, to the patient's morbid obesity (providing a larger total body fluid reserve for buffering electrolyte changes) or to idiosyncratic factors. It is possible that the "discomfort" which led to induction of general anesthesia represented neurologic symptoms of TURP syndrome rather than receding spinal anesthesia. This diagnostic challenge is a potential trap for the unwary clinician, since acute volume shifts may make the TURP syndrome patient hemodynamically unstable. General anesthesia also makes it impossible to identify further changes in the patient's level of consciousness.

When severe hyponatremia is diagnosed, the clinical response will depend to some degree on the patient's actual condition. The following steps should be considered:

- Truncation or termination of the surgical procedure.
- Close examination of the patient for signs of pulmonary edema; respiratory support as needed.
- Increased monitoring: continuous arterial pressure, frequent electrolyte assay.
- Administration of furosemide (10-20 mg intravenously).
- Cautious administration of hypertonic saline (see below).
- Postoperative intensive care admission.
- Discussion with the patient, family and surgical team.

continued on page 45

and resources (both financial and personnel) of the state component society and the role that AAs will fulfill in meeting the needs in the health care community. Moreover, it should be determined how the anesthesia community will benefit from the ACT. It is also critical to a successful legislative campaign to notify the ASA and the American Academy of Anesthesiologist Assistants (AAAA) of the state's interest in seeking AA practice authority. Both organizations have considerable resources to support such efforts and can offer assistance with a legal strategy, a public relations campaign, testimony, lobbying experiences, opposition defense and drafting legislation. Another crucial step would be to review current state statute to determine the most logical regulatory scheme (either physician delegatory authority or licensure) by which to regulate AA practice. It would be inadvisable and foolhardy to initiate a legislative effort without first engaging in these foundation-building tasks.

Once the leadership of the state component society has resolved to move forward, the general membership has been educated about the AA profession and the legislative initiative, and the AAAA and ASA have been consulted, the process is ready to progress to the next step: "coalition-building." The component society must identify an anesthesiologist champion in the state to shepherd the bill through the process. Identifying the appropriate bill sponsor is part science and part magic. Considerations for a sponsor include a strong relationship with state anesthesiologists, their history on issues of medicine and health care, committee assignments and prominence within the legislative body. Other than the bill sponsor, another important facet for consideration is contacting non-anesthesiology stakeholders in state health care. In no particular order of importance, organizations such as the state medical and hospital associations, the state medical board, and the state's surgical colleagues should all be contacted to gauge their interest in support or opposition of bringing AAs into the health care system.

With these steps accomplished, the process of bringing AAs into the state is well under way. The trajectory of the bill in the legislative house is anything but predictable. However, with proper planning and the foresight to utilize the resources available, the chances of success are increased exponentially. The American Academy of Anesthesiologist Assistants stands ready to assist in these efforts.

Case Report From the Anesthesia Incident Reporting System

continued from page 36

The change to glycine as an irrigating solution would reduce the risk of serum hypoosmolarity relative to distilled water, but would not improve hyponatremia. Because this patient required continuous bladder irrigation postoperatively, ongoing fluid absorption was a possibility. The change to 0.9 percent saline irrigant following the procedure would prevent further hyponatremia but would increase the risk of symptomatic intravascular overload. Tracheal intubation and mechanical ventilation were reasonable precautionary steps.

The use of hypertonic saline to correct hyponatremia is dangerous, because overly rapid correction may cause central pontine myelinolysis and a fatal neurologic injury. In the absence of severe symptoms, the recommended approach is to restrict fluid absorption, diurese gently and allow for gradual and spontaneous correction over hours to days. If hypertonic saline is used, the rate of correction should be no more rapid than 0.5 mmol/L/hr, with very frequent monitoring of serum sodium.

Clinical Follow-Up

The LMA was changed to an endotracheal tube and the patient was transported to the intensive care unit. An arterial line was placed to facilitate close hemodynamic monitoring and frequent laboratory studies. The patient remained hemodynamically stable. After administration of 250 ml of 3 percent hypertonic saline over 6 hours on postoperative day 1, the patient's serum sodium increased from a nadir of 111 mEq/L to 117 mEq/L. His continuous bladder irrigation fluid was changed from water to 0.9% saline. He was extubated on postoperative day two with serum sodium of 126 mEq/L, and was neurologically intact. Subsequent recovery was uneventful.

The Last Word

Clinical suspicion is the most important tool for prevention and management of TURP syndrome, which can occur despite the best efforts of the anesthesia team. Close observation, symptom-specific treatment and good surgical communications led to a favorable long-term outcome in this case.