

## Dilutional Hyponatremia Associated with Intrauterine Endoscopic Laser Surgery

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The use of the Nd-YAG laser for intrauterine endoscopic procedures is a recent therapeutic technique in gynecologic surgery. To enhance visibility through the hysteroscope, the uterine cavity is expanded by a continuous infusion with a solution of 1.5% glycine. In some circumstances, large amounts of glycine may be absorbed leading to dilutional hyponatremia.

## CASE REPORT

A 36-yr-old, 48 kg, 150 cm woman was admitted for laser endoscopic resection of an uterine septum 1 wk after undergoing a laparotomy for tubal surgery and myomectomy. Before surgery hormonal menopause was induced by gonadotropin-releasing hormone (GnRH) implant to reduce the uterine volume and endometrial vascularization. Physical examination and preoperative routine laboratory findings were normal (serum potassium 4.4 mM, serum sodium 139 mM, serum chloride 103 mM, and hematocrit 36%). One hour after receiving 0.5 mg atropine im and lorazepam 2 mg by mouth, anesthesia was induced with fentanyl 0.1 mg, droperidol 1.25 mg, and thiopental 250 mg. Following atracurium 20 mg iv, the trachea was intubated uneventfully. Anesthesia was maintained with N<sub>2</sub>O 66% in oxygen and isoflurane 1%. Monitoring included ECG, end-tidal CO<sub>2</sub>, pulse oximetry (SpO<sub>2</sub>), esophageal stethoscope, and temperature. A 1.5% glycine solution connected to a lateral port of an Hamou-Storz hysteroscope was infused under 140 mmHg of pressure to distend the uterine cavity for laser resection.

The resection time was 30 min and a positive balance of about 2,000 ml of 1.5% glycine solution was estimated. During the procedure, the patient received 1,000 ml of an iv infusion of Ringer's lactate solution. Emergence from anesthesia was uneventful. In the recovery room, laboratory findings showed a profound hyponatremia (serum sodium 115 mM) with hemodilution (plasma protein content 4.5 g/l; hematocrit 28% and osmolarity 263 mosm/l). Physical examination of the patient was normal without symptoms of hyponatremia or hypervolemia. After insertion of a bladder catheter, the patient received mannitol 20% 5 ml/kg and furosemide 40 mg. A urinary output of 10 ml · kg<sup>-1</sup> · h<sup>-1</sup> was associated with a rapid correction of the biologic parameters. (serum sodium 124 mM after 1 h and 131 mM after 3 h). The patient was discharged from the recovery room after 5 h of observation without any sequelae.

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## DISCUSSION

Endoscopic intrauterine YAG laser surgery is a relatively new technique for resection of fibromas, septa, and polyps and for endometrial ablation in cases of recurrent bleeding.<sup>1-3</sup> During the operative procedure, irrigating solution is continuously infused through the hysteroscope. This infusion distends the uterine cavity, allowing adequate surgical visualization and washing away blood and tissue particles. Glycine 1.5% was chosen for its excellent optical and nonhemolytic properties.<sup>4</sup> The relative stiffness of the uterine wall is what causes the high infusion pressure required to distend the uterine cavity. This pressure in turn may lead to large amounts of glycine being absorbed in both intravascular and extravascular compartments, leading to hypervolemia and hyponatremia similar to that which occurs during transurethral resection of the prostate.<sup>4,5,¶</sup>

The uterine wall is thick, lesions are generally not encapsulated, and irrigation fluid pressure may be greater than the normal pressures of veins. Moreover, glycine solution may pass through the open fallopian tubes into the peritoneal cavity.<sup>1</sup> During the menstrual cycle, the endometrium is well developed (proliferative and secretory phase) with an important vascularization, which may increase fluid absorption. GnRH agonists reduce the uterine size and the endometrial vascularization.<sup>1,6</sup> We do not know the relative importance of each of these factors on the absorption of glycine from the uterine cavity. Our experience shows that when a laparoscopy is associated with the hysteroscopic laser resection, only a small amount of liquid can be reaspirated from the peritoneal cavity. This suggests that glycine solution is probably mainly absorbed by open blood vessels in the uterus and that the extent of the resection might be more influential for glycine absorption than the resection time. In the present case the resection time was only 30 min.

General anesthesia may mask the early signs of massive absorption of glycine. Therefore, as recommended for transurethral resections, regional anesthesia should be considered for endoscopic laser resection.<sup>4,5,\*\*</sup> Unfor-

¶ Bowman TM, Rein P, Keenan R: Glycine induced ammonia toxicity following transurethral resection of the prostate. *Anesthesiology Review* 13:39-42, 1986

\*\* Bready LL, Hoff BH, Boyd RC, Wilson MA, Ritter RR: Acute hyponatremia associated with transurethral surgery. *Anesthesiology Review* 12:37-41, 1985

tunately, when laparoscopy is associated, this is uncomfortable for the patient.

In summary, to minimize the risk of severe acute dilutional hyponatremia and intravascular overload, we manage the patients undergoing endoscopic YAG laser uterine surgery as follows. Intravenous fluids are given as sparingly as possible. An artificial menopause is induced several weeks before surgery with GnRH implant or lysterenol to decrease the liquid absorption by the endometrium and reduce the uterine volume. Whenever possible, regional anesthesia is preferred. When a laparoscopy is associated with the hysteroscopic surgery, as much liquid as possible is reaspirated through the laparoscope and if not, by culdocentesis. The absorption of fluid is estimated and serum sodium is monitored when fluid absorption exceeds 1,500 ml. In high-risk patients, insertion of a central venous pressure catheter is considered.

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## Cardiorespiratory Arrest Following Initiation of Cranial Irradiation for Treatment of a Brain Stem Tumor

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Central nervous system (CNS) radiotherapy is frequently employed in the treatment of intracranial tumors.<sup>1</sup> Although rare, adverse reactions to CNS radiotherapy have been reported. Pochedly described radiation-induced encephalopathy that occurred weeks to months following therapy.<sup>2</sup> Acute herniation has also been described in a special subset of patients with meningeal leukemia.<sup>3</sup> We report a case of acute neurologic deterioration following radiotherapy in a patient with a malignant brain stem tumor.

### REPORT OF A CASE

The patient was a 5-yr-old, 20 kg, white girl with a 2-wk history of headaches, right sided extremity and facial weakness, decreased sensation in the right arm, gait ataxia, and slurred speech. Computed tomography (CT) and magnetic resonance imagery (MRI) brain scans demonstrated a large left pontomesencephalic mass without hydrocephalus. The patient was taken to the operating room for a stereotactic

biopsy of her brain stem lesion. The procedure was uneventful, and the permanent pathologic sections revealed undifferentiated, primitive neuroepithelial medial tumor. Four days later the patient was discharged from the hospital, at which time she was receiving dexamethasone 4 mg four times a day.

Three days later the patient developed a worsening of her right hemiparesis and increased lethargy. CT scan revealed a new rim of edema surrounding the tumor without significant hydrocephalus. In an effort to shrink the lesion, a palliative course of brain stem radiotherapy was planned. Radiotherapy treatment was facilitated by the use of 40 mg mepéridine, 20 mg phenergan, and 20 mg chlorpromazine given by intramuscular injection. The procedure was uneventful apart from posttreatment sedation of approximately 8 h. Because of this and the need to position the patient prone, general anesthesia was planned for the second treatment. Anesthesia was induced with 125 mg sodium thiopental in divided doses, 1 mg midazolam, and 4 µg sufentanil. Vecuronium (1 mg) was used to facilitate intubation. Following tracheal intubation and patient positioning, controlled hyperventilation was instituted with 100% oxygen to achieve an end-tidal carbon dioxide level (ETCO<sub>2</sub>) of 30 mmHg. After the 5- to 10-min radiotherapy session, 10 mg edrophonium with 0.5 mg atropine was given to reverse the effect of the muscle relaxant. Naloxone (100 µg) was administered slowly to antagonize the sufentanil. The trachea was extubated smoothly after patient arousal, and the patient was sent to the postanesthesia care unit (PACU) drowsy and with stable vital signs. Following 2 h of observation in the PACU, the patient's level of consciousness had recovered to her pretreatment level and she was discharged to the ward. Two hours after her return to the ward she was found lying on the floor, unresponsive, apneic, and with vomitus draining from her mouth. No signs of focal motor or generalized seizures were noted. Cardiopulmonary resuscitation and tracheal intubation were successfully accomplished. Neurologic examination revealed pupils that were equal and reacted to light. All reflexes were present, and the patient was

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