

DELAYED EMERGENCE FOLLOWING CEREBELLOPONTINE ANGLE TUMOR RESECTION

INTRODUCTION

Emergence from anesthesia can be defined as a state of consciousness of a patient when he or she is awake or easily arousable to their immediate surroundings and identity. A patient recovering from general anesthesia can usually respond to verbal stimuli when alveolar anesthetic concentration is decreased to roughly 30% of minimum alveolar concentration (MAC), if recovery is not impeded by other factors. The use of inhalational anesthetics, neuromuscular blocking agents, as well as intravenous opioids and hypnotics can impede a patient's recovery from anesthesia in the perioperative setting. Further, a patient's recovery from general anesthesia can be delayed by underlying metabolic dysfunction, intraoperative complication, and other patient-specific factors. Since delayed recovery from anesthesia is multifactorial in causation, high vigilance to case-relevant risk factors and rare side effects is essential for successful outcomes.

CASE PRESENTATION

A 60-year-old 96 kg male (BMI 31) with no known allergies presents for resection of cerebellopontine angle (CPA) tumor via retrosigmoid transtemporal approach to the posterior cranial fossa. The patient's past medical history was significant only for cigarette smoking (0.5 pack per day, 10 pack-year). He initially presented to neurosurgery in 2015 with complaints of acute onset headache, dizziness, and hearing loss in the right ear. MRI back then demonstrated an enhancing mass in the right CPA concerning for schwannoma vs. meningioma. He was followed for several years before recent routine imaging demonstrated enlargement of the mass, prompting surgical resection. The patient was brought into the operating room and placed under ASA standard monitoring. In the supine position, general anesthesia was induced via pre-existing intravenous access (18-gauge angiocath L hand) before orotracheal intubation was achieved via video laryngoscopy with a McGrath™ laryngoscope and size 8.0 NIM EMG endotracheal tube was placed for intraoperative nerve monitoring (IONM). An additional 16-gauge angiocath was placed in the R hand, and a R radial arterial line was placed before the patient's bed was turned 180 degrees and his head placed in a Mayfield skull clamp. The patient was subsequently placed in the left lateral position and the neurosurgery team began the operation. General anesthesia was maintained on total intravenous anesthesia (TIVA), utilizing propofol (50-70 mCg/kg/min, 1687.5 mg total) and fentanyl (50-150 mCg/hr, 557.5 mCg total). Sevoflurane was utilized in the early stages of the case but did not exceed 0.5 MAC per surgeon request in order to avoid IONM disturbances. Serial arterial blood gases (ABG) were obtained q-1 hour to monitor the patient's electrolyte and acid-base status, the results have been summarized into Table 1 for reference. Just after resection of the tumor, the surgeon noted that the patient was "oozy" and a thromboelastogram (TEG) was sent. Results can be found in Table 2. Intraoperative course was otherwise uneventful, without any significant hemodynamic shifts or notable events. The neurosurgery team concluded the procedure and both the propofol and fentanyl infusions were discontinued just prior to the removal of the Mayfield clamp/pins. The patient was turned 180 degrees and was weaned from controlled ventilation to spontaneous respiration, breathing at 550-700 mL tidal volumes without ventilatory assistance.

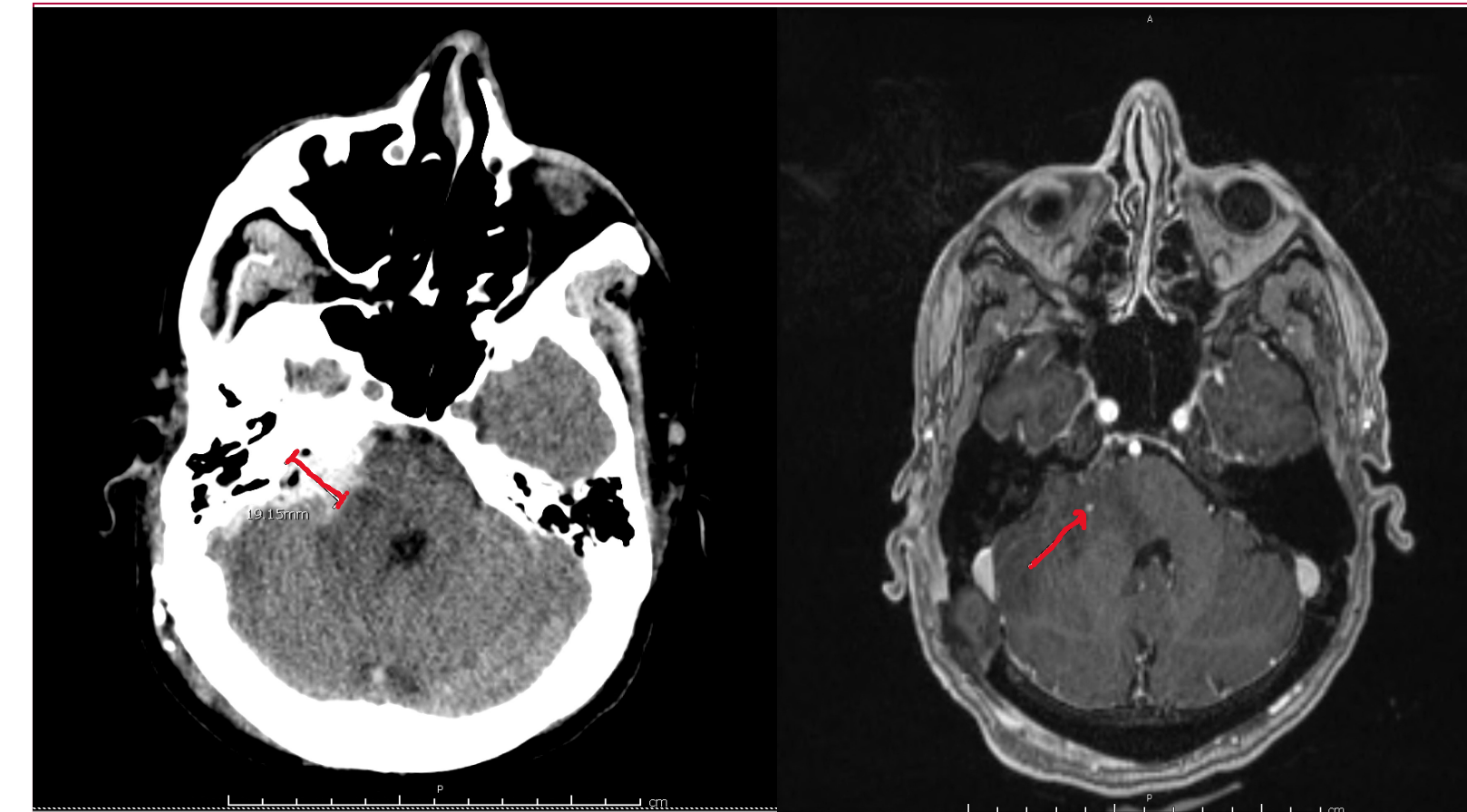
CASE CONTINUED

In preparation for extubation, the patient's oral-pharynx was suctioned. All vital signs were stable within normal limits, and spontaneous respiratory pattern continued in a regular pattern with adequate tidal volumes as previously mentioned. Upon physical examination, the patient's pupils were equal, round, and reactive to light without signs of miosis or mydriasis. His skin was warm, dry, and intact with good turgor, no rashes or lesions. When extubation was attempted, the patient had not received fentanyl or propofol for over 60 minutes. Expiratory sevoflurane was measured at 0.0%. Upon trying to arouse the patient, he was persistently unresponsive to both verbal and painful stimuli. It was noted that the patient would exhibit a subtle grimace intermittently and deglutition was intact and intermittent. 40 mCg of naloxone was then administered but did not elicit any significant changes after 20 minutes. 50 mg of Doxapram was then administered but was also unsuccessful in making the patient responsive to verbal painful stimuli. Using a Cook® Airway Exchange Catheter, the 8.0 NIM EMG tube was exchanged for a regular Parker Flex-Tip™ 8.0 endotracheal tube. The patient's ventilatory status was unchanged throughout this process within normal limits but remained a 3 on the Glasgow Coma Scale (GCS). The decision was then made to transport the patient downstairs to radiology for emergent CT imaging of the brain with suspicion for intracranial hemorrhage. No gross abnormalities were observed by the neurosurgery team initially, pending radiology report. The patient was then transported to the PACU where he was extubated successfully on room air without complication but maintained his status as a GCS 3, unresponsive to verbal or painful stimuli. All vital signs remained within normal limits. He underwent serial CT and MRI imaging of the brain the day after the procedure which demonstrated "Right posterior fossa subdural hemorrhage in the right cerebellopontine, cerebellomedullary angle with superior extension into the right tentorial leaflet as well as heterogeneous density hemorrhage in right lateral cerebellum with cerebellar edema. CT and MRI imaging are shown to the right.

TABLE 1

	0741	0941	1141	1341	1541
pH	7.51	7.51	7.42	7.40	7.41
pCO ₂	32.3	31.4	39.0	33.9	33.8
pO ₂	220	203	212	172	190
BE	+2	+2	-1	-1	-1
HCO ₃	25.1	24.9	22.9	22.9	22.8
Na ⁺	139	137	139	139	139
K ⁺	3.8	3.8	3.7	3.7	3.7
Glu	90	93	124	130	131
Hct	31	31	31	29	29
Hgb	10.6	10.5	10.5	9.9	9.9

SIGNIFICANT FINDINGS



Left: CT imaging post-op day #1 demonstrating right posterior fossa subdural hemorrhage in the right cerebellopontine, cerebellomedullary angle with superior extension into the right tentorial leaflet as well as heterogeneous density hemorrhage in right lateral cerebellum.

Right: Brain MRI post-op day #2 showing 13-14 mm extra-axial hematoma at the right cerebellopontine angle, consistent with CT study findings. There is a punctate enhancing focus at the junction of the pons and right middle cerebellar peduncle as well as a small amount of subdural hemorrhage along the right tentorium.

DISCUSSION

Delayed emergence/recovery from general anesthesia is perhaps one of the biggest challenges faced by the anesthesia care team. The time to recover from general anesthesia is affected by a multitude of factors but can be organized into four main categories: (1) surgical and anesthetic factors (long surgery and anesthesia, use of paralytic agents, prolonged hypotension, hypoxia, hemorrhage, embolism, surgery type), (2) patient factors (extremes of age, co-morbidities, genetic variation, cognitive dysfunction, body habitus), (3) drug factors (dosing, blood gas solubility, metabolism, excretion, drug interactions, etc.), and (4) metabolic factors (hypo/hyperglycemia, hypo/hyponatremia, hypothermia, hypothyroidism, hepatic/renal failure, central anticholinergic syndrome, etc.). The ability to accurately diagnose the underlying cause of delayed recovery from general anesthesia is imperative for determining appropriate therapy, however in the acute setting primary management on behalf of the anesthesia care team is to maintain the airway, breathing, and circulation until the root cause is identified and corrected.

CONCLUSIONS

This patient's difficulty recovering from anesthesia immediately following the procedure was likely related to a posterior fossa hemorrhage discovered in serial imaging in the days following the tumor resection. Initially, opioid overdose was included in our differential diagnosis, although our suspicion was low given adequate spontaneous respiratory effort, absence of pupillary miosis, and no response to naloxone administration. Further, the patient had no response to Doxapram, lowering suspicion for volatile anesthetic overdose. The patient's past medical history was not significant for enzymatic dysfunction or organ failure, and serial arterial blood gases were within normal limits throughout the duration of the case, lowering suspicion for metabolic etiology. The patient had received the same medications in the past for more minor procedures without any adverse reaction or complications. Given stable vital signs and hemodynamic stability throughout the entire case, suspicion was low for ischemic stroke. Given surgical site and size of tumor, suspicion for hemorrhage was high and later confirmed via imaging.

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TABLE 2

