Anterior pituitary tumors account for nearly 18% of all intracranial tumors. Pituitary adenomas that cause hypersecretion of growth hormone lead to acromegaly in adults. Patients with acromegaly may present unique problems for the anesthetist because of the overgrowth of airway soft tissues; a difficult mask ventilation and challenging intubation can be expected. A careful preoperative assessment of the patient's airway is essential, and an awake oral or fiberoptic bronchoscopy may be necessary. Postoperatively, these patients are at risk for developing airway problems and diabetes insipidus; therefore, they warrant careful observation.

A 42-year-old, 75-kg, ASA physical status III, white male presented 8 months after suffering a head injury in which he was knocked unconscious for approximately 3 minutes. He began experiencing severe headaches, visual changes, and a marked increase in the size of his hands and feet. Four months before admission, he underwent bilateral carpal tunnel repairs. The patient was diagnosed with acromegaly after an extensive endocrine and neurosurgical evaluation.

This is a case report of a patient with acromegaly who underwent an elective transsphenoidal hypophysectomy.

Key words: Acromegaly, adenoma, anterior pituitary, growth hormone, hypophysectomy, transsphenoidal.

Introduction
The frequency of intracranial tumors is estimated to be about 5 per 100,000, with anterior pituitary tumors accounting for nearly 8 to 18% of the total. More than 99% of the cases of acromegaly are the result of a pituitary adenoma, and the primary treatment is transsphenoidal surgery. This is a case report of a patient who sustained a traumatic head injury, developed symptoms of acromegaly, and subsequently underwent an elective transsphenoidal hypophysectomy for removal of a pituitary adenoma.

Case report
A 42-year-old, 75-kg, ASA physical status III, white male presented after an extensive endocrine and neurosurgical evaluation. He complained of severe frontal headaches, visual changes, decreased libido, loss of appetite, a 25-pound weight loss, occasional numbness of his hands and forearms, and an increase in the size of his hands and feet.

The patient claimed that these symptoms began occurring approximately 8 months prior to admission when a 25-pound smoked ham fell from a ceiling hook onto his head, rendering him unconscious for approximately 3 minutes. The initial computed tomographic (CT) scan was normal, and repeat CT scans and a magnetic resonance imag-
The physical examination was remarkable for coarse facies; an enlarged mandible and temporal bony structures; a large, broad nose; and large, thick hands and feet. The patient’s airway was assessed. He was able to breathe normally, but his tongue and mandible were enlarged. A difficult intubation was not anticipated. His lungs were clear, and his heart tones were normal.

Neurologically, cranial nerves II-XII were intact, his visual acuity was slightly decreased, and his deep tendon reflexes were intact. Good radial pulses were present bilaterally, despite the previous carpal tunnel repairs, and a radial artery line was planned.

The patient denied any allergies; his current medications included bromocriptine and acetaminophen. He had a cigarette smoking history of two packs per day for 6 years, and he drank two to three six packs of beer every weekend. The patient was diagnosed with acromegaly and admitted for an elective exploration of the pituitary gland.

Preinduction lines included a right radial artery line and a peripheral intravenous line. The patient was sedated with 2 mg midazolam and taken to the operating room, where electrocardiogram, pulse oximeter, and blood pressure monitors were placed.

The patient was preoxygenated and induced with sufentanil 20 μg, lidocaine 100 mg, thiopental 425 mg, and vecuronium 10 mg. Endotracheal intubation was accomplished easily, and end-tidal CO₂ was monitored. His eyes were lubricated and taped closed. The operating table was tilted with the head elevated less than 15 degrees, and the patient’s head was secured in a headrest with skull pins. All pressure points were padded. Maintenance anesthesia was accomplished with 1.5%-2.0% isoflurane in 100% oxygen. Complete paralysis was achieved with 2-mg doses of vecuronium every 20 minutes.

The patient was hyperventilated to keep end-tidal CO₂ between 25 to 30 mmHg, and arterial blood gases were monitored. A nitroglycerin infusion and bolus doses of sufentanil and labetalol were used to control blood pressure responses during periods of surgical stimulus.

A transnasal transphenoidal partial anterior lobe hypophysectomy was performed. A fat and fascia autograft was placed into the sella turcica, the sinuses were packed, and the bilateral nasal airways were sutured to the nasal columella.

The patient emerged from anesthesia smoothly and was extubated without incident in the operating room after reversal of neuromuscular blockade, return of reflexes, ability to follow commands, and demonstration of a stable respiratory pattern. The patient continued to improve postoperatively, with a decrease in the growth hormone level to 2.2 mg/dL. He was discharged home 6 days later in stable and satisfactory condition.

Pathophysiology

The pituitary gland, or hypophysis, is located in the sella turcica at the base of the brain. The anterior pituitary secretes luteinizing hormone, follicle stimulating hormone, growth hormone, thyroid stimulating hormone, melanocyte stimulating hormone, adrenocorticotropic hormone, prolactin, and endorphins. The posterior pituitary acts as a storage site for vasopressin and oxytocin. The hypothalamus regulates release of these hormones and is subject to regulation through a negative feedback mechanism.

Eighty percent of pituitary tumors are chro- mophobe adenomas that usually compress the optic chiasma and tract. Headaches and deterioration of vision are usually the presenting symptoms, but occasionally the tumor may present as hypopituitarism. Twenty percent are eosinophil adenomas that cause effects by hypersecretion of growth hormone.

Manifestations of excessive growth hormone include an enlarged sella turcica, headache, visual field disturbances, rhinorrhea, prognathism, soft tissue overgrowth of the lips, tongue, epiglottis, and vocal cords, connective tissue overgrowth, peripheral neuropathies, visceromegaly, glucose intolerance, osteoarthritis, osteoporosis, hyperhidrosis, and skeletal muscle weakness with fatigue. The overgrowth of the tissues is reflected in coarse facial features, an increase in the size and length of the mandible, and enlarged hands and feet.

Development of peripheral neuropathies, such as carpal tunnel syndrome, is common as a result of trapping of nerves by tissue overgrowth. Even in the absence of symptoms, about 50% of patients have inadequate collateral blood flow through the ulnar artery in at least one hand. Hypertension that leads to congestive heart failure is common, and the incidence of coronary artery disease, arrhythmias, and cardiomegaly is increased.

Lung volumes are increased, and ventilation-to-perfusion mismatch is likely to occur. Exertional dyspnea may be related to heart failure.
or respiratory insufficiency due to kyphoscoliosis. Excessive growth hormone often results in retention of sodium and potassium, inhibition of the peripheral action of insulin, glucose intolerance, diabetes mellitus, thyroid goiter, premature atherosclerosis, and a hypoadrenal status because of inhibited adrenocorticotropic hormone secretion.

**Anesthetic management**

Hypophysectomy is often performed for acromegaly, Cushing's disease, or metastatic cancer of the breast or prostate gland. Special anesthetic considerations of the transphenoidal approach include oral endotracheal intubation, oropharyngeal packing, and surgical use of epinephrine, cocaine, and lidocaine to reduce bleeding and create an anesthetic plane for dissection.

A thorough knowledge of baseline endocrine function is important, because surgical trauma may alter pituitary function. Glucose tolerance may be disturbed, so glucose levels must be monitored. Corticosteroid coverage equivalent to hydrocortisone 100 mg every 4 hours intramuscularly may be given during the first 24 hours postoperatively and changed to oral maintenance thereafter. Sedatives and tranquilizers should be given in conservative doses to avoid the likelihood of somnolence and the potential for airway obstruction.

The goals of anesthetic management are to achieve rapid airway control after a smooth induction, to avoid or control significant blood pressure and heart rate increases, and to avoid cardiac arrhythmias. Planning for a quiet and rapid emergence from anesthesia and an early evaluation of vision and other neurological function is important.

A major problem for the anesthetist is the overgrowth of airway tissues, which makes patients susceptible to airway obstruction and difficult visualization of the vocal cords by laryngoscopy. Therefore, all patients with acromegaly should be considered potential difficult endotracheal intubation candidates. A smaller internal diameter endotracheal tube may be needed because of a narrowed glottic opening and enlargement of the vocal cords. Hoarseness and abnormal movement of the vocal cords can reflect thickening of the cords or paralysis of the recurrent laryngeal nerve due to stretching by overgrowth of cartilaginous structures.

An awake oral intubation or fiberoptic bronchoscopy with a previous indirect laryngoscopy may be indicated in the patient with severe airway problems. The distorted facies may also make it difficult to achieve a good mask fit. Patients with acromegaly are also subject to postoperative airway compromise because of their enlarged jaw and tongue and the overgrowth of laryngeal cartilage.

Intravenous induction is usually achieved with thiopental, with the patient placed with balanced salt solutions. Glucose solutions should be avoided because of their potential for causing osmotic diuresis and cerebral edema. Maintenance intravenous fluids should be kept to a minimum.

Blood loss is usually minimal and can be replaced with balanced salt solutions. Glucose solutions should be avoided because of their potential for causing osmotic diuresis and cerebral edema. Maintenance intravenous fluids should be kept to a minimum.

The patient should be able to react quickly and breathe adequately after surgery. The pharyngeal pack must be removed and the oropharynx suctioned gently and thoroughly to decrease the likelihood of aspiration, laryngospasm, and coughing. The patient must demonstrate return of all reflexes, be able to follow commands, and have a stable respiratory pattern before extubation.

Ideally, such patients should awaken in the operating room, and coughing, bucking, and gagging should be avoided. Supplemental oxygen should be given as a safety measure, and if the airway is difficult to maintain or ventilation does not keep arterial CO₂ less than 40 mmHg, the pa-
tient should be reintubated until adequate breathing and gas exchange can be established. A postoperative tracheostomy is rarely required.

Serious postoperative problems usually occur with larger tumors. Cerebral ischemia may occur due to arterial spasm of the cavernous sinus. A large bleed or intraoperative hemorrhage may result from laceration of the carotid artery. Hypothalamic injury or stroke can occur. Visual field changes may result from direct injury or from interruption of the vascular supply to the optic chiasma or nerve, and cerebral spinal fluid rhinorrhea can also occur. Other potential problems include postoperative bleeding into the operative site, migration of the fatty tissue autograft that is placed in the sella turcica, and the pulmonary and cerebral sequelae of venous air embolus that occurs in approximately 5% of these patients. The most common problem is diabetes insipidus, which is caused by insufficient release of antidiuretic hormone; up to 75% of patients will develop it. Strict intake and output, urine and serum electrolytes, and osmolality should be monitored closely. Antidiuretic hormone or exogenous vasopressin therapy should commence if urine output decreases or increases abruptly.

Summary

Anterior pituitary tumors that cause hypersecretion of the growth hormone lead to acromegaly in adults. Excision of adenomas of the anterior pituitary account for the vast majority of transsphenoidal operations performed.

Patients with acromegaly provide the anesthetist with unique and challenging problems because of the overgrowth of airway tissues. A careful preoperative assessment of the airway is essential, because an awake oral or fiberoptic bronchoscopy may be necessary. These patients must be kept under deep anesthesia and completely paralyzed. The end-tidal carbon dioxide must be kept between 25-30 mmHg, and the blood pressure and heart rate responses to surgical stimuli must be carefully controlled to prevent bleeding into the surgical site. Postoperatively, these patients are at risk for developing diabetes insipidus and airway problems; as a result, they warrant careful observation.

REFERENCES


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