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Case Report

Neuroanesthesia Management in Transsphenoidal Pituitary Cyst Surgery

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ABSTRACT

Background: Neuroanesthesia management of patients with masses in the sella area undergoing transsphenoidal surgery is a challenge for anesthesiologists. We present a case report containing preoperative, intraoperative, and postoperative management.
Case: A 45-year-old man with complaints of headache and visual disturbances. From the vision examination results obtained visus test 1/60 (count fingers) and narrowed visual field area. From computerized tomography (CT) scan and Magnetic resonance imaging (MRI), images of the head obtained a picture of the cystic mass of the suprasellar sella pressing the optic chiasm. The patient was planned for surgical excision of pituitary cyst per transsphenoidal. The patient underwent general anesthesia with endotracheal intubation with intravenous induction fentanyl, propofol, atracurium, and lidocaine, followed by maintenance with sevoflurane inhalation agent with 60% oxygen. During the operation, the hemodynamic condition was stable, and postoperatively, the patient was extubated in the operating room and then treated in the intensive care unit.
Conclusion: In pituitary cyst patients undergoing transsphenoidal surgery, the preoperative evaluation is mainly aimed at airway assessment, neurological disorders, and hormonal disorders in patients. During intraoperative, the anesthesiologist is expected to optimize cerebral oxygenation, maintain hemodynamic stability, facilitate the surgical area, prevent and manage intraoperative complications, and aid in rapidly recovering consciousness. Postoperatively, an excellent neuroendocrine evaluation is required.

Keywords: Pituitary cyst, transsphenoidal surgery, neuro anesthesia management

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INTRODUCTION

Neuroanesthesia management of patients with masses in the sella area is challenging for anesthesiologists.[1] Mass lesions in the sella area can include pituitary adenomas, Rathke cleft cysts, craniopharyngiomas, and less commonly metastases and lymphoma. Lesions Damage to the sella region can result in severe consequences, primarily due to the impact on neighboring structures, such as the pituitary gland and the optic chiasm, caused by mass effects.[2] Clinical features in patients with lesions in the sella area can be functional mass frequently present with symptoms of hormone excess and nonfunctional mass have symptoms resulting from mass effects of the tumor, such as headache, visual loss due to compression of the optic chiasm, or hypopituitarism due to compression of anterior pituitary.[1,2]

The objectives in treating patients with pituitary tumors involve the control of excessive hormone release, reduction of tumor mass, normal pituitary function preservation, prevention of long-term effects from excess hormone secretion and prevention of tumor recurrence. While medical treatment can effectively control hyperfunctioning tumors, surgical removal has emerged as the primary therapeutic approach, with transsphenoidal pituitary surgery currently being the predominant method utilized.[1,2]

Transsphenoidal pituitary surgery presents unique challenges for neuroanesthesiologists. This case report review will discuss the preoperative, intraoperative, and postoperative management associated with transsphenoidal pituitary surgery, which has been shown to improve the patient's quality of life.

CASE

A 45-year-old man with a body weight of 65 kg and height of 165 cm from anamnesis, the patient complained of headaches and vomiting a month ago. The headache has decreased after taking medication, but sometimes it is still often

felt if the position changes from lying to standing, the body often complains of feeling weak, the vision has blurred in the last three months, and the patient has no history of other previous diseases. From the physical examination of the patient, no abnormalities were found in the airway; the patient could open his mouth approximately three fingers, mallampati score 2, with a tiromental distance of six centimeters in the examination of respiratory function also obtained normal results with breathing rate of 18 times per minutes, oxygen saturation of 98% on room air, no additional breath sound was found. The circulation also obtained normal results: the pulse rate was 80 beats per minute, blood pressure was 130/80 mmHg, and no abnormal heart sounds were found.

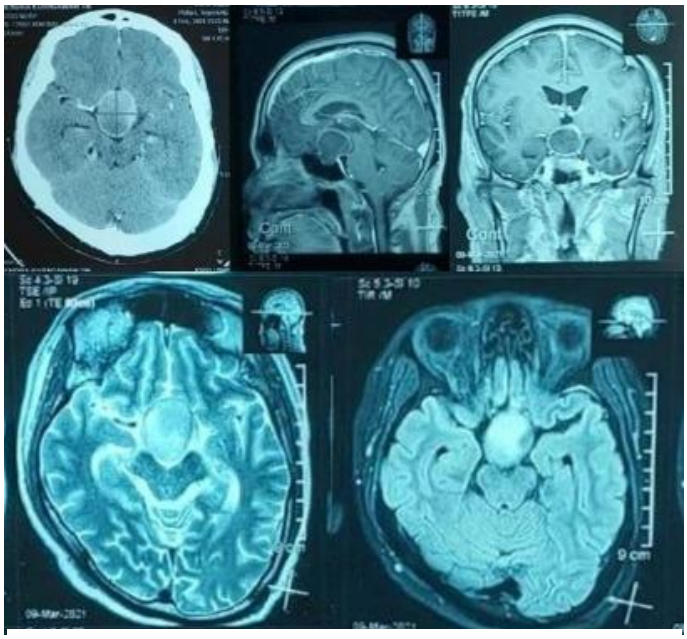

Figure 1. Head CT-Scan and head MRI

The patient was fully conscious of neurological function, with motor and sensory strength within normal limits. Still, there was a disturbance in visual function, where the patient was found to have 4 millimeters of mydriasis round pupils in both eyes, negative light reflexes in both eyes, vision examination 1/60 (counting fingers), and narrowed visual field. Genitourinary, gastrointestinal, and limb examinations were within normal limits. Laboratory examination, especially serum electrolytes and hormonal function (Cortisol, TSH, T3, FT4, Prolactin), obtained results within normal limits. From imaging examination, the thorax x-ray was within normal limits; from the CT scan of the head, a mass of the suprasellar was found, suspected Rathke Cleft Cyst, and from MRI of the head an orbita, a cystic mass of the suprasellar was found compressed the optic chiasm (**Figure 1**). Due to the progressive deterioration of the patient's visual function, neurosurgery decided to perform surgical excision of the tumor per transsphenoidal.

When the patient arrived in the operating room, non-invasive monitors were installed. The patient exhibited a blood pressure reading of 130/80 mmHg, a pulse of 88 beats per minute with regular sinus rhythm, and oxygen saturation of 97% with room air. The patient underwent general anesthesia endotracheal intubation with intravenous induction using fentanyl (200 µg), propofol (150 mg), atracurium (30 mg), lidocaine (80 mg), and continued with inhalation gas maintenance of sevoflurane 1 MAC and oxygen 60 % (3 lpm).

During surgery, the patient's hemodynamics were stable with a pulse rate of 70-80 beats per minute with regular sinus rhythm, with systole pressure of 110 – 130 mmHg and diastole of 70 - 80 mmHg, oxygen saturation of 98 - 99%, and end-tidal CO_2 33 - 35 (**Figure 2**). During surgery, the patient received NaCl 0.9% 1000 mL and lactated Ringer's 500 mL, with a bleeding amount of 200 mL. The operation lasted two hours, and the patient was extubated smoothly in the operating room. Subsequently, the individual was transferred to the intensive care unit for postoperative monitoring.

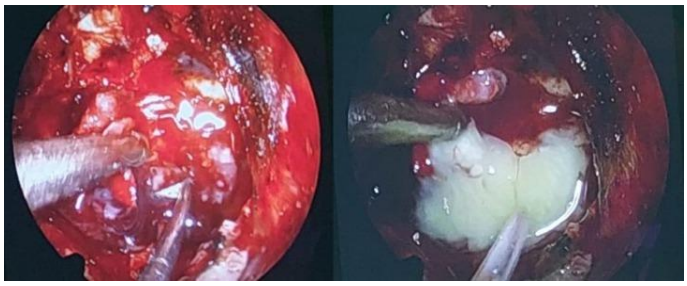

Figure 3. Intraoperative findings, cystic mass

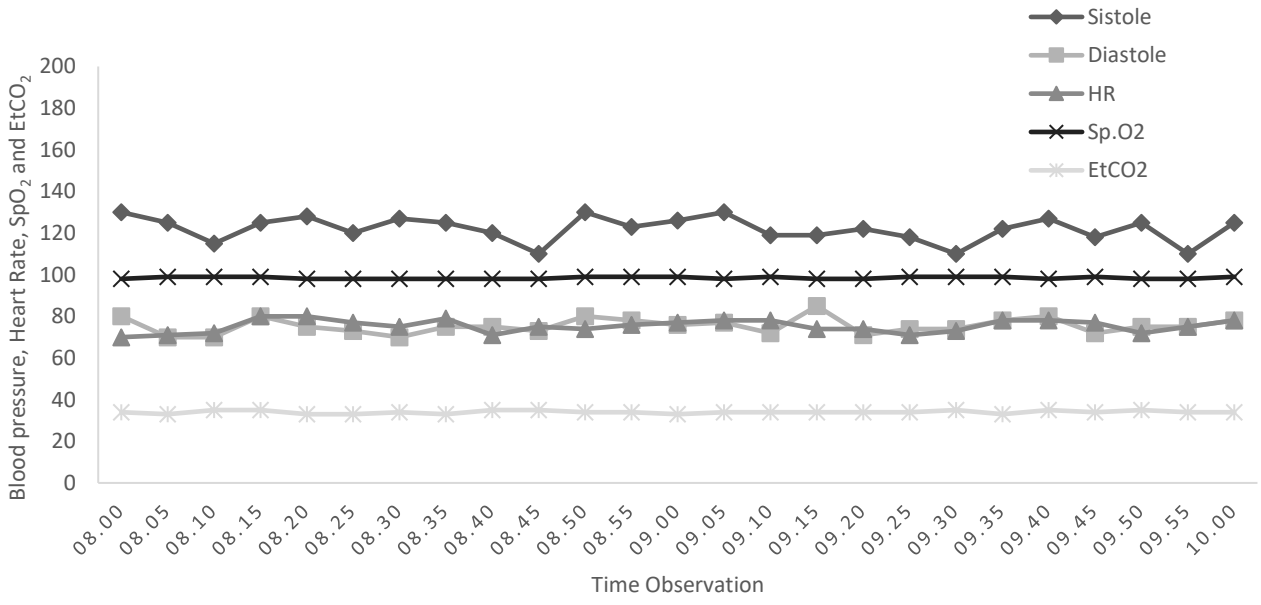

Figure 2. Intraoperative patient observation

The patient's condition was stable on the intensive care unit's first day of postoperative care. c, with no complaint of headache, nausea, and vomiting, with a pulse rate of 76 beats per minute with regular sinus rhythm, blood pressure 120/70 mmHg, oxygen saturation 96% with room air, urine production 1800 mL/24 hours (1.15 mL/body weight/hour), from laboratory tests obtained serum electrolyte levels within normal limits (Sodium 136, Potassium 3.7, Chloride 98). Following 24 hours of observation and treatment in the intensive care unit, the patient was moved to the standard care unit.

DISCUSSION

Perioperative management of patients with masses in the sella area undergoing transsphenoidal surgery is a challenge for anesthesiologists. A good undergoing of preoperative, intraoperative, and postoperative issues aims to achieve optimal outcomes and improve the patient's quality of life.

A detailed preoperative evaluation is essential in patients with sella masses undergoing transsphenoidal surgery. Evaluation includes history taking, physical examination, and laboratory and radiologic examination. In this case, the patient complained of a headache that had been relieved by medication, no nausea, and no vomiting; current complaints were mainly caused by decreased visual acuity and a narrowed visual field, which had been progressive in the last three months.

Symptoms and signs in patients with masses in the sella can be functional and nonfunctional abnormalities. Patients with functional masses show symptoms of hormone excess. In contrast, nonfunctional masses give a picture of mass effects such as headache, loss of vision due to the compression of the optic chiasm, and symptoms of hypopituitarism due to compression on the anterior pituitary. In pituitary masses, there are rarely signs of increased intracranial pressure, such as headache, nausea, vomiting, and papillary edema.[1] Rathke Cleft Cyst (**Figure 3**) is one of the nonfunctional tumors. Therefore, this tumor is not associated with hypersecretion of hormones; the clinical picture is related to the effect of the masses.[3]

The physical examination found that the patient's airway evaluation was still within normal limits with a three-finger open mouth, mallampati two six centimeters tiromental distance, and no limitations were found during neck flexion and extension.

In patients with acromegaly, airway management is challenging due to hypertrophy of the soft tissues of the mouth, nose, palate, epiglottis, and prognathism due to mandibular bone proliferation, which can cause difficulty in airway management and intubation.[4,5] Approximately 70% of patients with acromegaly have the risk of sleep apnea, which increases the risk of perioperative airway problems.[6,7,8] In patients with Cushing's disease, airway management is challenging due to obesity and increased risk of gastroesophageal reflux.[1]

The patient's blood pressure was 130/80 mmHg, pulse rate was 80 beats per minute with regular sinus rhythm, and no additional heart sounds were found, either murmur or gallop. Patients with acromegaly have a high risk of cardiovascular disorders such as coronary heart diseases, cardiomyopathies, congestive heart failure, hypertension, and arrhythmias due to increased secretion of excessive growth hormone.[9] Cushing disease, caused by increased adrenocorticotropin hormone, is also associated with an increased risk of cardiovascular disease, hypertension, and coronary heart disease, which are the main causes of perioperative mortality.[8,10,11] Hypertension should be medically managed, and patients should evaluated for cardiovascular risk factors before surgery.[12] The neurological status examination showed a decrease in visual acuity of 1/60 (counting fingers) and a narrowing of the visual field. Patients with nonfunctional masses show symptoms of mass effect, including vision loss and narrowed visual field temporal or bitemporal hemianopsia due to optic chiasm compression.[1,2,12]

From the laboratory examination, especially serum electrolytes in the patient, the results were within normal limits, and the hormonal examination was also within normal limits. All patients require preoperative laboratory evaluation before surgery (complete blood count) to evaluate the possibility of anemia or other hematological abnormalities. A metabolic panel to evaluate for possible hyponatremia, hypercalcemia, hyperglycemia, and other metabolic abnormalities is also indicated for preoperative assessment.[13] Severe hyponatremia may occur, usually associated with sella arachnoid cysts, Rathke cleft cysts, and pituitary apoplexy.[6] Endocrine laboratory tests should be evaluated, including thyroid panel (TSH, T3, FT4), cortisol, adrenocorticotropin hormone, luteinizing hormone, follicle-stimulating hormone, prolactin, insulin-like growth factor 1, and growth hormone.[1,6,12,13]

Among the endocrine abnormalities that can occur, a significant point of emphasis for the anesthesiologist is that the patient should be euthyroid before the elective procedure.[6] Diabetes mellitus is also common in patients with Cushing disease and blood glucose levels should be controlled preoperatively and intraoperatively.[1] Patients with acromegaly due to elevated growth hormone and patients with Cushing disease due to elevated adrenocorticotropin hormone are associated with an increased risk of cardiovascular events, which should be managed and evaluated preoperatively.[1] Radiological examination should be reviewed and evaluated for the tumor's size, location, and features, such as optic chiasm compression, extension into the cavernous sinus, or presence of hydrocephalus.[6]

The goals of anesthesia in transsphenoidal pituitary surgery include optimizing cerebral oxygenation, maintaining hemodynamic stability, facilitating the surgical area, preventing and managing intraoperative complications, and rapid recovery.[1]

Upon arrival in the operating room, patients are fitted with standardized monitors, including oxygen saturation, blood pressure, electrocardiogram, and end-tidal CO_2. Routine monitors are used during induction and maintenance of anesthesia, including electrocardiogram, oxygen saturation, pulse, temperature, and noninvasive blood pressure monitoring. Patients with acromegaly or Cushing disease with cardiovascular problems may require invasive monitoring. Surgery is usually performed with the patient in a sitting position so that the head and chest are elevated above the heart. This helps to minimize bleeding and optimize drainage but may increase the risk of venous air embolism.[12]

The patient underwent general anesthesia endotracheal intubation with intravenous induction using fentanyl, propofol, atracurium, and lidocaine. Various anesthetic techniques can be employed in pituitary surgery, and various agents can be used for induction and maintenance of anesthesia. Short-acting agents are preferred to facilitate rapid recovery and allow neurological examination immediately after surgery. Remifentanil, combined with propofol or a volatile agent, can be used as it provides hemodynamic stability and faster recovery than a volatile agent alone.[4] Both intravenous and volatile agents can be used to maintain anesthesia.[14]

In transsphenoidal surgery, the anesthetic measures aim to facilitate the surgical area. Several techniques can be used to facilitate the surgical area. Controlled hypercapnia can increase intracranial pressure and tumor exposure by pushing it

into the sella. A target PaCO2 of 40-45 mmHg is commonly used. For large tumors, lumbar intrathecal catheter insertion (lumbar drain) can be performed, and isotonic saline injection or cerebrospinal fluid drainage can move the pituitary up and down, facilitating the surgical area.[1]

Another complication intraoperative is diabetes insipidus, with clinical manifestation urine output ≥ 4 mL/kg/h, serum natrium 145 mEq/L, serum osmolality > 300 mOsm/kg, Urine osmolality < 300 mOsm/kg, polyuria persist ≥ 30 minutes and other causes of polyuria ruled out (mannitol, furosemide, osmotic contrast agents, hyperglycemia). This condition can be treated with vasopressin and fluid management and continued therapy and observation in the intensive care unit.[6]

Postoperative evaluation in the intensive care unit obtained a stable patient condition; the patient did not get complaints of headache, nausea, or vomiting, with visual function and visual field that had improved, obtained urine production 1800 cc/ 24 hours (1.15 cc/body weight/hour) with serum sodium 136.

An important focus of postoperative care in patients undergoing pituitary surgery is careful screening and evaluation for neuroendocrine disorders, such as fluid balance disorder, diabetes insipidus, and SIADH, as well as other complications, such as visual disturbances, cerebrospinal fluid leakage, and meningitis.[13] Diabetes insipidus occurs most commonly associated with surgery for macroadenoma, craniopharyngiomas, and Rathke's cleft cyst. The patient will have a large output of dilute urine coupled with polydipsia with a preference for cold water. The diagnostic hallmarks are a rising serum sodium (≥ 145 mM/L) and osmolarity (> 300 mOsm/kg) with a simultaneously dilute (hypo-osmolar) urine (< 300 mOsm/kg or urine specific gravity ≤ 1.005). The management of patients with DI must be tailored to the individual. They should remain in a closely monitored setting with daily weights recorded, strict intake and outtake monitoring, and frequent analysis of serum sodium, serum osmolarity, urine osmolarity, and subjective thirst rating. With an intact thirst mechanism and fluids available for oral repletion, most of these patients can self-regulate.[5,6] During mild polyuria (2-3 mL/kg per hour) where resolution is expected, replacement of the previous hour's urine output with appropriate fluid (usually iv 5% dextrose, iv 0,18% saline/4% dextrose or orogastric water in ICU) while closely monitoring plasma and urinary osmolality and electrolyte may suffice. Severe (> 3 mL/kg per hour) or persistent polyuria merits ADH/AVP or DDAVP administration.[15]

In cases where the patient cannot keep up with the diuresis and serum sodium exceeds 145 mM/L, desmopressin administration should be considered.[6,11] In central Diabetes Insipidus, vasopressin administration is also required to prevent ongoing free water losses. The usual dose is 2 to 5 units of aqueous vasopressin given subcutaneously every 4 to 6 hours.[17]

CONCLUSION

Neuroanesthesia management in patients undergoing transsphenoidal pituitary surgery requires good perioperative preparation. Preoperative evaluation includes history taking and physical examination, especially airway problems and neurological disorders, as well as laboratory examination to assess metabolic and hormonal disorders. Intraoperative is aimed at optimizing cerebral oxygenation, maintaining hemodynamic stability, facilitating the surgical area, preventing and managing intraoperative complications, and rapid recovery. Postoperative is for screening and evaluation of neuroendocrine problems such as fluid balance disorder, diabetes insipidus, and other complications.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest.

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