Case Report

A Patient with Cushing's Disease for Pituitary Tumor Resection: Anesthetic Challenges and Management

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Abstract

Adrenocorticotrophic hormone-secreting pituitary adenoma is though quite rare yet carries significant mortality and morbidity due to severe comorbidities associated with them. Transsphenoidal resection of pituitary adenoma is the treatment of choice. While managing these patients, anesthesiologists face hosts of challenges since there are significant alterations in pathophysiology of the body. A thorough understanding of preoperative assessment, intraoperative management, and potential complications is fundamental for successful perioperative outcome. We report a case of Cushing's disease who underwent pituitary tumor resection and discuss the difficulties encountered and their management.

Keywords: Anesthesia, Cushing's disease, pituitary gland, transsphenoidal surgery

Introduction

Pituitary tumors comprise around 80% of primary brain tumors undergoing intracranial operations.[1] Majority of them are nonfunctional. Out of secretory tumors, adrenocorticotrophic hormone (ACTH)-secreting tumors which leads to Cushing's disease (CD) are quite rare. They constitute only 7% of functioning tumors.[2,3] Transsphenoidal resection of pituitary adenoma is the treatment of choice in these patients.[4] The anesthesiologists face multitude of challenges while managing them since there is multisystem involvement resulting due to excessive levels of cortisol.[1] A detailed preoperative evaluation of airway, neurological, and endocrine status along with understanding of potential complications is the key to successful management of these patients. We present the anesthetic management of a typical case of CD who underwent transsphenoidal pituitary tumor resection.

Case Report

A 37-year-old female patient, American Society of Anesthesiologists status III, was a known case of CD and was scheduled to undergo transsphenoidal pituitary tumor resection [Figure 1]. There was a history of generalized body weakness, excessive weight gain (40 kg in 5 years), breathlessness on mild exertion, oligomenorrhea, and increase in facial and body hair since 5 years. She also complained of headache since 1 month, but there were no visual disturbances. The associated comorbidities were obesity (body mass index = 42 kg/m^2), hypertension (controlled on amlodipine and telmisartan), and diabetes (on regular insulin). On examination, she presented with classical features of CD such as truncal obesity, moon facies, hirsutism, and abdominal striae. Chest and cardiovascular system were normal on auscultation. Difficult airway was anticipated on account of short neck, macroglossia, and Grade III Mallampati grade. Routine investigations such as complete hemogram, blood urea, sugar, serum electrolytes, and chest X-ray were normal. Electrocardiogram (ECG) showed left axis deviation. Echocardiography revealed Grade I diastolic dysfunctions and mild left ventricular systolic dysfunction with ejection fraction 31%. There were increased ACTH levels in the blood (64.8 pg/ml; normal is <46 pg/ml), while rest of the hormones were within normal range. MRI scan brain showed a solid cystic lesion in the sella with no suprasellar extension. The treatment history revealed that patient was on metyrapone since past 6 months.

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Figure 1: Clinical photograph of the patient

After obtaining risk explained consent and adequate preoperative fasting of 6 h, the patient was taken up for surgery. Antihypertensives were continued and morning dose of insulin was omitted. Premedication was given in the form of tablet ranitidine 150 mg and tablet alprazolam 0.25 mg at night before surgery. She was positioned carefully on the operating table. The armrests were placed parallel to OT table to increase width so as to accommodate truncal obesity. Large-size blood pressure (BP) cuff was used for noninvasive BP monitoring and other monitors applied were heart rate, 5-lead ECG, and pulse oximetry. Intravenous access was obtained and difficult airway cart was kept ready. Following preoxygenation, induction of anesthesia was done with fentanyl 100 mcg and propofol 140 mg (slow intravenous and titrated according to loss of response to verbal command). A gentle check laryngoscopy was done which revealed Grade II Cormack and Lehane grade. Face mask ventilation was confirmed and vecuronium 6 mg was given. To attenuate cardiovascular response of intubation, lignocaine 80 mg was administered 90 s before intubation. Bougie-guided endotracheal intubation was successful at first attempt and care was taken to prevent any neck movements. For invasive BP monitoring radial artery was cannulated, other monitors included capnograph and axillary temperature. Oral packing was done and all pressure points were properly padded. Normal saline nasal drops were used to decongest nasal mucosa. Maintenance of anesthesia was achieved with isoflurane in oxygen and nitrous oxide, intermittent fentanyl boluses, and vecuronium. dexmedetomidine infusion was started at the rate of 0.4–0.7 mcg/kg/h and titrated to maintain BP within 20% of baseline value. Blood sugar levels and ABG were done at regular intervals.

The surgery lasted for 3 h during which partial hypophysectomy was done because tumor was not visualized. The surgeons used both microscope and endoscope for transnasal transsphenoidal approach. The patient remained hemodynamically stable throughout surgery. There was minimal blood loss, urine output was 300 ml, and normal saline transfused was 2000 ml. Toward the end of surgery, hydrocortisone 100 mg, PCM infusion 1000 mg, and ondansetron 6 mg were administered. After completion of surgery, inhalational agents and dexmedetomidine were discontinued and neuromuscular blockade was reversed with glycopyrrolate and neostigmine. Extubation was done when patient became fully awake and respiratory efforts were adequate. However, she complained of dyspnea after extubation, though the chest was clear on auscultation. Instructions were given to breathe through mouth, propped position was made, and positive pressure ventilation was done with Bains circuit. She maintained 95% saturation on 100% oxygen, over a period of 30 min, and she was able to maintain 93% saturation on 60% oxygen. Postoperatively, she was kept in high dependency unit, and strict monitoring carried out. After 7 days, she was discharged home.

Discussion

CD is a severe endocrine disease in which there are excessive levels of cortisol resulting from ACTH secretory pituitary adenoma.[4] It was first described by Harvey Cushing after studying autopsy findings.[5] The incidence is 1.2–2.4 per million of population. Its peak incidence is found in the age group of 25–40 years and majority occur in females (female: male = 5:1). As compared to nonfunctioning pituitary tumors, the mortality is much higher (2.39 vs. 1.24). The major cause of death is cardiovascular and cerebrovascular events.[6] Initially, surgeons were reluctant to operate because of normal sella on skull radiographs and unclear etiology of the disorder. Hence, medical management was the treatment modality followed. Later, the introduction of optical magnification systems for microsurgery and the development of new devices and instruments for microsurgical techniques led to a revival of transsphenoidal surgical approach.[7] Nowadays, transsphenoidal resection of pituitary tumor remains the first line of treatment which is followed by remission in 78% of patients.[8]

Excessive circulating levels of corticosteroids results in characteristic pathophysiological changes that present a range of problems to anesthetists. The host of challenges encompasses difficult ventilation and intubation, hemodynamic disturbances, volume overload, hypokalemia, glucose intolerance, diabetes, maintaining blood cortisol levels, and preventing glucocorticoid deficiency.[9]

Obesity occurs in 32%–41% of patients with CD and is the pathognomonic signs of CD.[10] Due to increased adipose tissue, thin skin, osteopenia, and easy bruisability, there are increased chances of position-related injuries.[6] Therefore, we took utmost care while positioning the patient and padded all pressure points. Airway problems were anticipated in our patient; there was large sized tongue, short and thick neck, Mallampati Grade III, and thick pad of fat at the nape of neck. Awake fiber-optic intubation considered as gold standard was not our first choice because anatomical landmarks in neck for giving blocks were obscured by fat. Intubating laryngeal mask airway was also not a reasonable option due to macroglossia

and increased soft tissue in oropharynx. Videolaryngoscope would have been a good alternative, but they were not available at our setup.[2,3,11] A good laryngoscopic view and adequate mask ventilation prompted us to administer neuromuscular blockers. In cases of difficult airways, one should try to secure airway using technique in which one has proficiency and conventional direct laryngoscopy and intubation is the most commonly used method of airway management.

Cardiovascular disease represents the direct complication of CD and incidence of hypertension is 55%–80% of patients with CD.[4] Our patient had poor cardiac reserve making her more vulnerable to adverse events due to hemodynamic fluctuations occurring during various steps of surgery such as placement of nasal speculum and sphenoid dissection. To obtund these responses and maintain hemodynamic stability, we used dexmedetomidine infusion. It is a selective alpha 2 agonist which has proved its worth in counteracting cardiovascular perturbations in different groups of patients. Incremental doses of opioid and propofol would have obliterated them but at the cost of recovery.[12] Another precaution taken in this patient was avoidance of adrenaline containing local anesthetics. We monitored invasive BP, but for severe cases, pulmonary artery catheterization and transesophageal echocardiography can be done for monitoring cardiac functions.

Maintaining euglycemia was the other challenging task. Diabetes occurs in 20%–40% of these patients.[4] Blood sugar levels should be maintained around 120–180 mg/dl and both hyper and hypoglycemia are deleterious in these patients.[9] We strictly monitored blood sugar levels perioperatively and managed according to sliding scale for insulin. Blood loss is not an issue in pituitary surgery unless there is injury to vessel or sinus. Fluids were transfused cautiously to prevent fluid overload. Steroid replacement therapy varies from institution to institution. We gave a single dose of steroid intraoperatively, and postoperatively, cortisol levels were checked and steroid administered accordingly. The surgery was a conundrum for surgeons too; the tumor being too small was not visualized and thus partial hypophysectomy was performed.[13]

Postoperatively, the patient developed respiratory problem. Excessive deposition of fat around thoracic cage leads to decreased lung and chest wall compliance.[9] Nasal packing can also aggravate the problem. Traditional method of CPAP cannot be applied in these patients because of nasal packing.[2,3,14] We used Bain's circuit and gave positive pressure ventilation by slightly closing the APL valve. Propped position was done and instructions were given to breathe through mouth. All these helped to relieve breathing difficulties.

To conclude, management of patients undergoing pituitary surgery for CD involves cluster of challenges and the hallmark of anesthetic management is thorough preanesthetic evaluation, meticulous planning, and a multidisciplinary team comprising endocrinologist, neurosurgeon, anesthesiologist, and intensivist.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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