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Case Report

Anaesthesia Section

Anaesthetic Management in a Patient with Pituitary Macroadenoma: A Case Report

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ABSTRACT

Pituitary tumours are the second most common intracranial tumours. The anaesthetic management of pituitary tumours requires an in-depth understanding of the principles of neuroanaesthesia and pituitary disorders. Immaculate preanaesthetic evaluation, intraoperative management and postoperative care with interdisciplinary teamwork are essential for successful outcomes in surgeries for pituitary tumours. This case report discusses a 34-year-old female patient presenting for the management of a pituitary macroadenoma, illustrating the anaesthetic challenges faced in such cases. The presence of acromegaly, along with co-morbidities such as hypertension, necessitated a detailed anaesthetic management plan. The patient underwent thorough preanaesthetic evaluation and had a transnasal trans-sphenoidal tumour excision under general anaesthesia, following standard protocols for difficult airway management. The patient was intubated using a video laryngoscope and invasive blood pressure and central venous pressure monitoring were conducted. Following surgery, the patient was transferred to the neurosurgery intensive care unit and was subsequently discharged on the 10th postoperative day.

Keywords: Acromegaly, Adenoma, General anaesthesia, Pituitary neoplasm

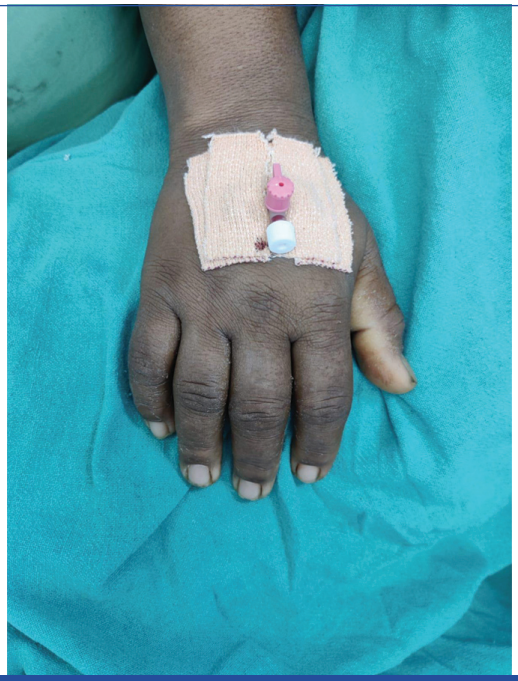
CASE REPORT

A 34-year-old hypertensive female patient presented with diminished vision in her left eye over the past two months, severe episodic headaches around the forehead and episodes of giddiness and vomiting over the past year. She noticed reduced effort tolerance, snoring, insomnia and enlargement of her hands and feet, along with facial puffiness in the past six months. She was taking telmisartan 40 mg orally. The patient has no history of similar complaints, not a known case of diabetes mellitus, tuberculosis, or bronchial asthma and no history of prior surgical interventions or hospitalisations.

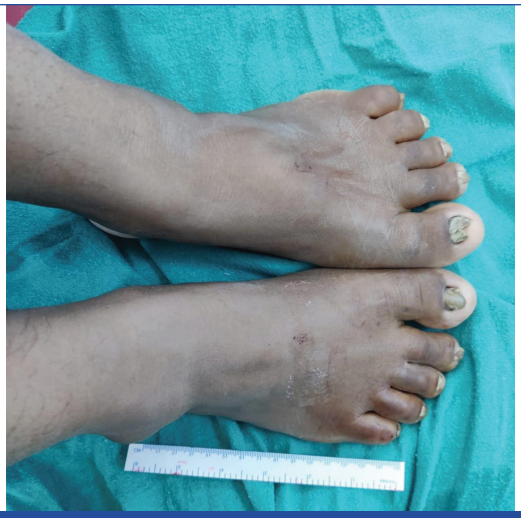
The general examination revealed a prominent forehead, thickened eyelids, an enlarged nose and lips, prominent nasolabial folds, macroglossia and features of acral enlargement such as large hands and feet with short, stubby fingers [Table/Fig-1-4]. The heart rate was 98 beats per minute, blood pressure was 158/94 mmHg, respiratory rate was 16/minute, and SpO_2 was 96% on room air. Airway examination showed a large, thick, protruding tongue [Table/Fig-1,2]. The mouth opening was greater than three fingers and the Mallampati Classification (MPC) was class III. The thyromental distance measured 5.4 centimeters. No remarkable findings were noted in the systemic examination.

[Table/Fig-1]: Coarse facial features with macroglossia.

[Table/Fig-2]: Macroglossia, reinforced endotracheal tube fixed at the left corner of mouth.



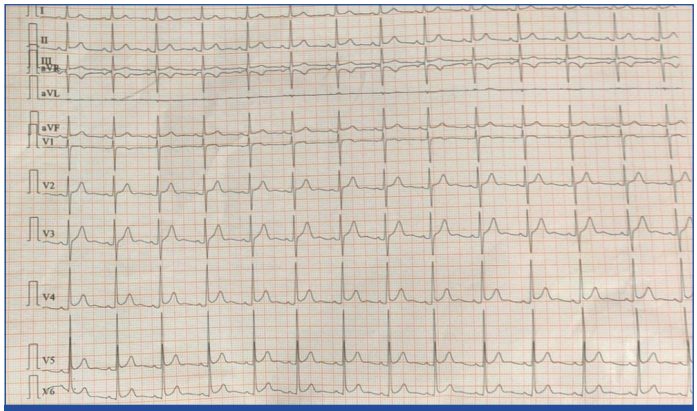
[Table/Fig-3]: Short stubby fingers.



[Table/Fig-4]: Acral enlargement.

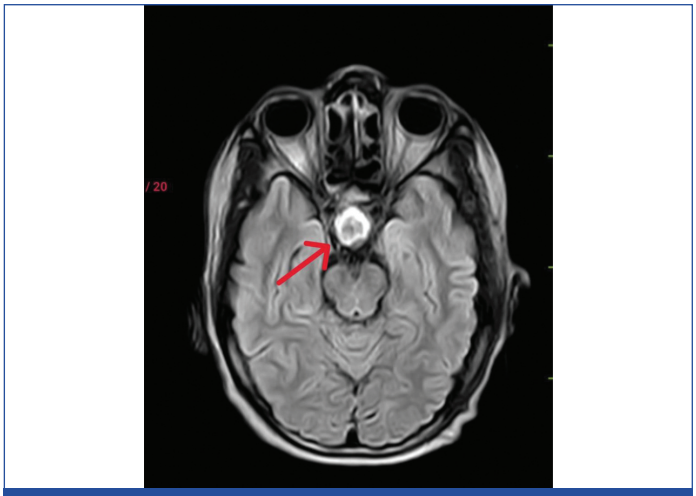
The patient weighed 78 kilograms, measured 1.55 meters in height, and the Body Mass Index (BMI) was calculated to be 34.6 kilograms per meter squared. Visual field examination revealed left homonymous hemianopia. Investigations showed haemoglobin at 12.5 grams per deciliter, a total leukocyte count of 7300/microliters, and a platelet count of 250,000/microliters. The coagulation profile, liver function tests, and kidney function tests were within normal limits. Hormone assays were performed, revealing an elevated growth hormone level of 55 ng/dL (normal value is <10 ng/dL). Prolactin, luteinising hormone, follicle-stimulating hormone, thyroid-stimulating hormone, and adrenocorticotropic hormone levels were normal.

The electrocardiogram showed normal sinus rhythm with left ventricular hypertrophy [Table/Fig-5]. A 2D echo indicated an ejection fraction of 60% and concentric left ventricular hypertrophy. The chest radiogram was normal. Magnetic Resonance Imaging (MRI) of the brain with contrast revealed a sellar and suprasellar soft tissue lesion measuring 3.2×2 cm with heterogeneous postcontrast enhancement, causing mass effect on the optic chiasm [Table/Fig-6]. The impression was a large, heterogeneously enhancing altered signal intensity lobulated extra-axial space-occupying lesion in the sellar and suprasellar region measuring approximately 3.2×2 cm. Multiple areas of hyperintensity with blooming on the gradient echo sequence were noted. The lesion was observed to cause mass effect on the optic chiasm superiorly, resulting in superior displacement fissure suggestive of intralesional haemorrhage, indicating a mass lesion, with the possibility of a macroadenoma to be ruled out [Table/Fig-6]. Histopathological examination confirmed the diagnosis of pituitary macroadenoma.



[Table/Fig-5]: Electrocardiogram showing left ventricular hypertrophy.

A preanaesthetic evaluation was conducted. The patient and relatives were counselled about the anaesthesia procedure and associated risks. She was scheduled for transnasal trans-sphenoidal tumour excision under general anaesthesia under the American Society of Anaesthesiologists (ASA) class III. The patient was kept fasting as



[Table/Fig-6]: MRI showing suprasellar tumour.

per guidelines and was shifted to the operating room on the day of surgery after obtaining consent. Multipara monitoring was attached.

The peripheral venous access was performed with difficulty using a 20-gauge intravenous cannula on the dorsum of the left hand [Table/Fig-2]. The patient was administered injection glycopyrrolate 0.2 mg intravenously and injection midazolam 2 mg intravenously. Airway management was anticipated to be difficult and intubation was planned with a video laryngoscope. A modified rapid sequence induction was planned and a difficult airway cart was kept ready. Appropriate sizes of reinforced and plain 7 mm and 7.5 mm endotracheal tubes were arranged. Injection lignocaine 40 mg was administered intravenously, followed by injection fentanyl 150 mcg intravenously, and 375 mg thiopentone intravenously was given. After checking for the ability to ventilate, injection rocuronium 100 mg intravenously was administered, and the patient was oxygenated for one minute. Gentle video-directed laryngoscopy was performed, and the vocal cords were visualised. A 7.5 mm endotracheal tube was placed after coating the cuff with lignocaine jelly. After confirming bilateral air entry, the tube was fixed at 22 cm at the level of the incisors at the left corner of the mouth [Table/Fig-2]. Throat packing was done. Right internal jugular vein central venous catheterisation was performed under ultrasound guidance using a 7 French triple lumen catheter. The right radial artery was cannulated and invasive blood pressure monitoring was conducted. Urinary catheterisation was performed to monitor urine output hourly and an oesophageal temperature probe was placed. Anaesthesia was maintained with oxygen, air, sevoflurane and rocuronium. Analgesia was provided with intermittent intravenous doses of fentanyl. An anticonvulsant injection of levetiracetam 500 mg, injection paracetamol 1 gm and injection hydrocortisone 100 mg intravenously were administered intraoperatively. Blood loss was estimated to be approximately 150 mL. At the end of the procedure, the throat pack was removed. The patient was reversed with injection sugammadex 200 mg intravenously. After ensuring adequate spontaneous respiratory efforts, the patient was extubated and shifted to the neurosurgery intensive care unit, where they were observed for 48 hours and discharged on postoperative day 10.

DISCUSSION

Pituitary adenomas are the second most common intracranial tumours. They develop from the anterior pituitary cells and are primarily benign. Only a small percentage, known as pituitary carcinomas (0.1-0.2%), are metastatic [1]. Previous classification was based on size: macroadenoma (≥1 cm) and microadenoma (<1 cm) [2]. The newer classification is based on immunohistochemistry, electron microscopy and size: functional or non functional based on hormone production status [3].

Clinical manifestations are attributed to three factors: hormone production or the lack thereof, a mass effect due to their size and

the tumour's cell type. Macroadenomas are usually responsible for producing mass effects such as headaches and visual field defects. Larger macroadenomas can cause hypopituitarism, cranial nerve palsies and hydrocephalus [2].

Anaesthetic management in patients undergoing surgery for pituitary adenomas presents a challenging scenario and requires a thorough understanding of neuroanaesthesia principles and pituitary disorders. A comprehensive preanaesthetic evaluation should be conducted. Careful airway assessment is important. Patients may present with acromegaly due to excessive growth hormone production. Various structural changes of the airway, such as macroglossia, hypertrophy of oropharyngeal soft tissue and enlargement of the epiglottis and aryepiglottic folds can lead to difficulties in managing the airway during intubation. The accuracy of the Mallampati grade may not correlate with the actual internal structures. Therefore, a difficult airway may be encountered despite patients presenting with Mallampati grades I and II [4].

The difficult airway trolley should be kept ready with laryngoscopes featuring well-illuminated blades of various sizes, endotracheal tubes of different sizes, laryngeal mask airways, bougies, cricothyrotomy kits, oral and nasal airways, retrograde intubation equipment and an intubating flexible fiberoptic bronchoscope.

Arunkumar R and Anandakrishnan S reported the case of a 69-year-old male patient with a pituitary macroadenoma and a difficult airway who was scheduled for transnasal trans-sphenoidal tumour excision. They conducted fiberoptic intubation to manage the difficult airway in their patient [5]. Similarly, Rishi K et al., reported a difficult airway in a 51-year-old male patient presenting with acromegaly due to a pituitary adenoma, who was scheduled for tumour excision. This patient exhibited airway involvement characterised by a large protruding tongue, facial puffiness and a large, hypertrophied uvula and epiglottis, with Mallampati class IV [6].

Preoperative radiographic imaging and indirect laryngoscopy are required if a thyroid swelling is present. Obstructive sleep apnoea indicates difficulties in ventilatory strategies and cardiovascular complications postoperatively [7]. The association with cardiac anomalies such as left ventricular hypertrophy, coronary artery disease, arrhythmias, valvular lesions, cardiomyopathies and congestive heart failure makes electrocardiograms, echocardiography and dobutamine stress tests of prime importance [4]. Nair A et al., in their case report of a 52-year-old male patient with a pituitary adenoma, reported 2D echo findings of a reduced ejection fraction of 29%, severe left ventricular dysfunction, grade II diastolic dysfunction, moderate mitral regurgitation, global hypokinesia, dilated left atrium and ventricle [8]. Neurological and ophthalmic examinations for the detection of raised intracranial pressure and visual field defects are necessary. Endocrinological manifestations due to the tumour include diabetes mellitus, Cushing's disease, thyroid disorders and prolactinomas causing menstrual abnormalities, galactorrhoea, reduced sperm count and erectile dysfunction [9]. Patients with Cushing's disease have associated co-morbidities such as hypertension, diabetes, hyperlipidaemia, greater chances of having obstructive sleep apnoea, and immunosuppression, which can cause concurrent infections, fragile skin that makes venous cannulation difficult, easy bruising, and osteoporosis [10]. Mehrotra M and Basu A in their case study of the anaesthetic management of acromegaly due to a pituitary adenoma, reported difficulties in gaining venous access in their patient [11]. Truncal obesity, gastroesophageal reflux, perioperative haemorrhage and myopathy are other anaesthetic challenges [12]. Before proceeding with surgery via the trans-sphenoidal approach, the nasal mucosa must be prepared with lignocaine-adrenaline infiltration and xylometazoline spray to minimise bleeding from the nasal mucosa. Adrenaline infiltration can cause a hypertensive response in patients with Cushingoid features [13].

The goals of anaesthetic management include haemodynamic stability, maintenance of normal intracranial pressure, balanced cerebral circulation and oxygenation, favourable surgical exposure, and rapid and smooth emergence from anaesthesia. Armoured endotracheal tubes or Ring Adair Elvin (RAE) tubes are preferred [13]. Throat packs are used in surgeries with a trans-sphenoidal approach. Induction agents used are thiopental or propofol. Adequate muscle relaxation must be maintained with relaxants such as vecuronium. Despite controversies regarding their use, inhalational agents like isoflurane, sevoflurane and desflurane are employed. These agents may produce a rise in Intracranial Pressure (ICP), which can be counteracted by inducing hypocarbia through hyperventilation. The use of nitrous oxide is avoided in cases with raised intracranial pressure; in such cases, Total Intravenous Anaesthesia (TIVA) is preferred over balanced anaesthesia [13]. Controlled hypercapnia with a $PaCO_2$ of 60 mmHg or high normocarbia (40-45 mmHg) for shifting the suprasellar part of the tumour for easier surgical access should be approached with caution due to the deleterious effects of hypercarbia, such as hypertension, tachycardia and myocardial ischaemia [14]. Opioids (fentanyl or remifentanil) are used for intraoperative analgesia [14].

Positioning during surgery is crucial, as trans-sphenoidal surgery is typically performed in a semisitting position, which carries the risk of venous air embolism. This can be detected using end-tidal CO_2 monitoring, arterial blood gas measurements and colour Doppler [15]. Induced hypotension while maintaining a Mean Arterial Pressure (MAP) of 65 mmHg allows for a clear surgical field by preventing oozing from the operating site. Intraoperative monitoring involves the use of standard monitors for Heart Rate (HR), Non Invasive Blood Pressure (NIBP), $EtCO_2$, and ECG. Invasive blood pressure monitoring should be used for patients with compromised cardiac conditions. The use of central venous catheters facilitates fluid management and haemodynamic monitoring. Emergence from anaesthesia should be smooth and rapid. Thorough suctioning and removal of throat packs should be ensured before extubation. Patients must be extubated only after complete awakening and re-establishment of protective airway reflexes, as Continuous Positive Airway Pressure (CPAP) cannot be applied after trans-sphenoidal surgery.

Postoperative complications include airway compromise, development of diabetes insipidus, Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH), cerebrospinal fluid leakage, and depletion of cortisol levels requiring replacement [16]. Hormonal replacement is necessary. Interdepartmental management of the patient involving a neurosurgeon, intensivist, anaesthesiologist and nursing staff is crucial.

CONCLUSION(S)

The authors present a case highlighting the anaesthetic management and difficulties encountered in a case of pituitary macroadenoma. A meticulous preanaesthetic evaluation focusing on airway management was conducted, alongside efficient airway handling. Careful haemodynamic monitoring and a smooth emergence were ensured during the intraoperative period. Therefore, co-ordinated efforts with a focus on detail in managing the airway, neuroendocrine factors and the smooth conduct of surgery are essential for successful outcomes.

REFERENCES

[1] Banskota S, Adamson DC. Pituitary adenomas: From diagnosis to therapeutics. Biomedicines. 2021;9(5):494.
[2] Menon R, Murphy PG, Lindley AM. Anaesthesia and pituitary disease. Contin Educ Anaesth Crit Care Pain. 2011;11(4):133-37.
[3] Appleby I, John R, Hirsch N. Pituitary disease and anaesthesia. Anaesth Intensive Care Med. 2020;21(6):312-16.
[4] Bajwa SJS, Bajwa S. Anesthesia and intensive care implications for pituitary surgery: Recent trends and advancements. Indian J Endocrinol Metab. 2011;15(7):224.
[5] ArunKumar R, Anandakrishnan S. Anaesthetic management in a patient with pituitary macroadenoma: A case report. IJCMR. 2020;7(8):H12-H13.

[6] Rishi K, Raja P, Sabapathy VA. Anaesthetic management of acromegaly: A case report. Int J Sci Res. 2023;12(09):59-60.
[7] Melmed S. Acromegaly pathogenesis and treatment. J Clin Invest. 2009;119(11):3189-202.
[8] Nair A, Nirale A, Sriprakash K, Gopal TVS. Dilated cardiomyopathy in acromegaly: Case report and anesthesia management. Anesth Essays Res. 2013;7(3):411.
[9] Lim M, Williams D, Maartens N. Anaesthesia for pituitary surgery. J Clin Neurosci. 2006;13(4):413-18.
[10] Hanson M, Li H, Geer E, Karimi S, Tabar V, Cohen MA. Perioperative management of endoscopic transsphenoidal pituitary surgery. World J Otorhinolaryngol - Head Neck Surg. 2020;6(2):84-93.
[11] Mehrotra M, Basu A. Anaesthetic management of a case of acromegaly in remote field location. Med J Armed Forces India. 2003;59(3):258-60.
[12] Murselović T, Makovšek A. Airway management in neuroanesthesia. Acta Clin Croat. 2023;62(Suppl1):119-124. Doi: 10.20471/acc.2023.62.s1.15.
[13] Saini V, Malhotra SK, Sharma K. Pituitary surgery and anesthetic management: An update. World J Endocr Surg. 2013;5(1):01-05.
[14] Smith M, Hirsch NP. Pituitary disease and anaesthesia. Br J Anaesth. 2000;85(1):03-14.
[15] Rau TR, Plaschke K, Weigand MA, Maier C, Schramm C. Automatic detection of venous air embolism using transesophageal echocardiography in patients undergoing neurological surgery in the semi-sitting position: A pilot study. J Clin Monit Comput. 2021;35(5):1103-09.
[16] Laws ER, Sheehan JP, editors. Pituitary surgery: A modern approach. Basel; New York: Karger; 2006. 285 p. (Frontiers of hormone research).

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