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Case Report

Perioperative management of craniopharyngioma resection through endoscopic endonasal approach in a super-super obese patient: A technical case report

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ABSTRACT

Background: The endoscopic endonasal approach (EEA) is increasingly used in minimally invasive surgeries for skull base lesions such as pituitary tumors. Although experienced facilities and neurosurgeons familiar with this technique can typically perform these surgeries routinely without special techniques or instruments, challenging cases can occasionally arise due to patient factors such as obesity. Here, we describe challenges encountered during neurosurgery in a patient with super-super obesity and introduce our unique technical nuances for management during tumor resection.

Case Description: We report about a 47-year-old man with a body mass index of 62.24 kg/m² who presented for neurosurgery with a diagnosis of craniopharyngioma, for which tumor resection using the EEA under general anesthesia was performed. While planning tumor resection using the EEA, several limitations due to extreme obesity were encountered as follows: (1) management of the respiratory and circulatory systems under general anesthesia, (2) non-feasible positioning on a standard operating table, and (3) complications with lumbar drain (LD) replacement to prevent post-operative cerebrospinal fluid leakage. These challenges were overcome through (1) multidisciplinary collaboration with anesthesiologists and cardiologists, (2) the set-up of two operating tables side by side, and (3) LD placement under awake status in the sitting position, respectively. With these innovations, total tumor resection was achieved using the EEA.

Conclusion: This case highlights the successful use of the EEA along with unique technical adaptations in a super-super obese patient with craniopharyngioma, demonstrating the importance of innovation and problem-solving in overcoming surgical challenges.

Keywords: Craniopharyngioma, Endoscopic endonasal approach, Lumbar drainage, Obese patient, Surgical setting

INTRODUCTION

The endoscopic endonasal approach (EEA) to the skull base is essential for comprehensive surgery of skull base lesions, including pituitary tumors, craniopharyngiomas, and meningiomas.[10] While experienced facilities and surgeons routinely perform EEA, tumor characteristics and patient factors (e.g., severe obesity) may introduce challenges.

Obesity is associated with increased morbidity and mortality, and its increasing incidence has significant implications for healthcare, with super-super obese (body mass index [BMI] >60 kg/m²) patients having an even greater risk.[1,2,7] Neurosurgeons and anesthesiologists face significant challenges during the perioperative management of such patients, including systemic management (e.g., ensuring respiration and circulation) and surgical set-up in operating rooms (ORs).[12]

Lifestyle changes and associated endocrine dysfunction, including acromegaly and Cushing's disease, have led to increased numbers of super/super-super obese patients requiring neurosurgery. Extending the EEA in extremely obese patients in daily clinical practice requires technical innovations. Therefore, neurosurgeons should consider the technical nuances of endoscopic endonasal surgery in such patients. Herein, we describe the challenges encountered during neurosurgery in a patient with super-super obesity and introduce our unique technical nuances for management during tumor resection.

CASE DESCRIPTION

This study was approved by the Ina Central Hospital Ethics Committee (approval number: 24-2), and informed consent was obtained from the patient. A 47-year-old man with super-super obesity (height, 176.0 cm; body weight, 192.8 kg; BMI, 62.24 kg/m²) experienced headaches and progressive blurred vision. Neuroimaging revealed a suprasellar tumor (maximum diameter, 35 mm) compressing the optic chiasma, suggestive of craniopharyngioma [Figure 1a and b]. Ophthalmological examination revealed decreased visual acuity (0.3)/(0.3) and bitemporal hemianopsia. Baseline pituitary hormone levels were within the normal range. Tumor resection through the EEA was scheduled, and the OR was arranged. In general, lumbar drain (LD) placement during the EEA is performed in the lateral decubitus position under general anesthesia. However, midline misalignment is concerning in patients with severe obesity, given the inability to accurately locate the spinous process due to pannus thickness and subcutaneous fat displacement by gravity. Therefore, an LD was inserted preoperatively under fluoroscopic guidance, with the patient awake and sitting upright [Figure 2a and b]. Following LD insertion, intubation was performed by the anesthesiologist using video laryngoscopy.

Positioning is challenging in patients with morbid obesity due to gravity-induced overhanging of the subcutaneous fat on the operating table with the usual positioning for the EEA. To resolve this issue, two operating tables were joined, with one table equipped with a four-pin head fixation system (Sugita Head Holder; Mizuho, Tokyo, Japan) [Figure 3a and b]. Under general anesthesia, the patient

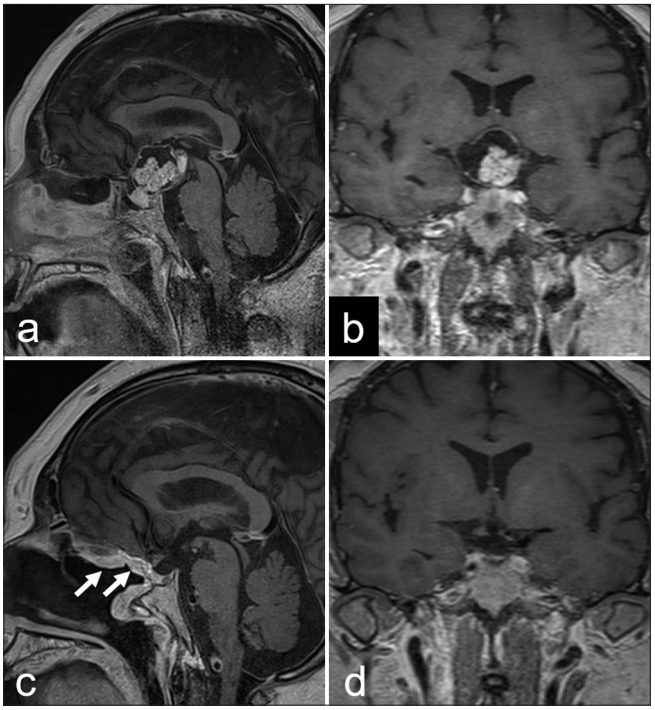

Figure 1: (a) Contrast-enhanced sagittaland (b) coronal magnetic resonance imaging (MRI) scans obtained before the endoscopic endonasal approach (EEA), showing the heterogeneously enhancing suprasellar mass with optic chiasma compression. The post-EEA MRI scan shows (c and d) gross total tumour resection with decompression of the optic apparatus and complete reconstruction of the skull base using a well-enhanced pedicled nasoseptal flap (arrow).

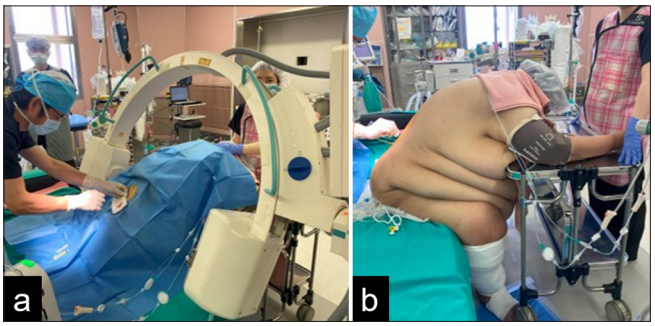

Figure 2: Preoperative lumbar drain placement (a) under fluoroscopic guidance (b) with the patient awake and in a sitting position.

was placed supine on the operating tables, and his head was fixed with the head up and vertex down, facing the surgeon, providing more direct endoscopic access to the nares [Figure 4a and b]. These positioning modifications improved the operating conditions by enabling a bloodless operative field, superior ergonomics for the application of endoscopic instrumentation, and a more intuitive intraoperative set-up. With these considerations and careful planning, applying to the EEA was possible. The tumor was grossly resected successfully by extending the EEA with

high-flow cerebrospinal fluid (CSF) leaks, and the skull base was reconstructed in multiple layers with a fat graft, some dural stitches, hard reconstruction using autologous septal bone, and a pedicled nasoseptal flap [Figure 1c and d].

Some factors, including cardiovascular strain, respiratory issues, medication dosing, and thrombosis risk, collectively contribute to increased postoperative risk in obese patients, necessitating diligent postoperative care. Therefore, anesthesiologists and cardiologists provided postoperative respiratory and circulatory management in the intensive care unit, and no complications or adverse events were observed during emergence from anesthesia and extubation. Postoperatively, the patient's visual function improved significantly. An LD was inserted for 3 days after surgery, and no postoperative CSF leaks occurred. Hormone replacement therapy was administered for hypopituitarism. Precise multidisciplinary perioperative management allowed for successful surgery. The patient consented to the publication of his image.

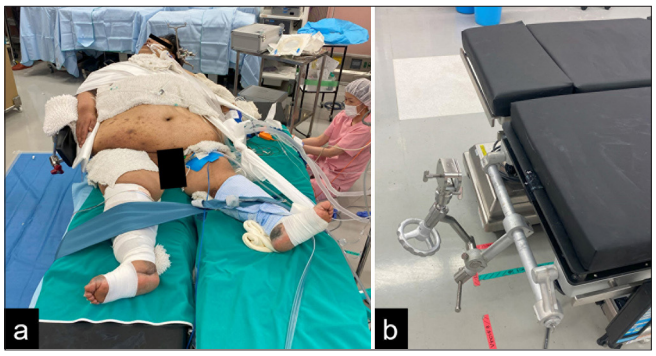

Figure 3: The operating room arrangement (a) with two operating tables joined in parallel to accommodate the patient with super-super obesity, and (b) the four-pin head fixation system attached to one of the operating tables.

DISCUSSION

The World Health Organization defines adult obesity as a BMI ≥30 kg/m^2, and additional classifications include severe, super, and super-super obesity (BMI ≥40, ≥50, and ≥60 kg/m^2, respectively).[1,2,7] Surgical management of patients with obesity has attracted significant attention in medical treatment. In neurosurgery, management of patients with extreme obesity is challenging, requiring additional management considerations due to their massive adipose tissue, altered anatomy, and compromised respiratory function.[7] No technical notes have described tumor resection through the EEA in patients with extreme obesity, and technical nuances persist. The limiting factors of extreme obesity encountered when planning tumor resection through the EEA in our patient included respiratory and circulatory system management during anesthesia, non-feasible operating table positioning, and LD replacement to prevent postoperative CSF leakage. These issues must be resolved for successful surgery.

Respiratory and circulatory system management during anesthesia

General anesthesia induction in patients with extreme obesity requires careful planning owing to the unique physiological challenges. The primary anesthetic concern in preoperative assessment is the patient's airway. The excess neck tissue limits the range of motion, complicating proper and safe intubation. Direct laryngoscopy is associated with increased risks of intubation failure in patients with extreme obesity; these patients also desaturate quickly, which is a crucial and dangerous consideration.[7] Due to an anticipated difficult airway, patients with extreme obesity are sometimes recommended for awake fiberoptic intubation or tracheotomy. Recently, video laryngoscopy has been widely used to enable safe intubation and reduce

Figure 4: Operating room photographs showing (a and b) the use of the four-pin head fixation system to tilt the head to the left and rotate it to the right to allow a convenient position and direct good view through the nostrils for the surgeon standing on the right side of the patient looking cranially.

the risk of complications in patients with super-obesity. In the present case, the anesthesiologist performed intubation using video laryngoscopy during tracheostomy preparation with the otolaryngologists, which was completed without any complications. Furthermore, perioperative respiration and circulation management, including careful medication dosing, vigilant airway management, and close monitoring, should be performed in the intensive care unit by an anesthesiologist and a cardiologist. Considering the unique challenges presented by these patients, systematic approaches can minimize the risks associated with anesthesia induction.

Operating table positioning

Optimal patient positioning is crucial in any surgical workflow, particularly endoscopic endonasal surgery.[5,8,13] Obesity can make it difficult for surgeons to position themselves ergonomically while maintaining requisite operative capability. Kilgallon *et al*. reported the usefulness of the hitchhiker position, in which the patient's right arm is outstretched and secured in a supine position, with surgeons standing in the axillary area, for EEA in highly obese patients.[8] However, it limits the positioning of cosurgeons, and it is possible that injuries could result from excessive abduction of the upper extremity. Therefore, the OR should be arranged to accommodate such patients and ensure surgical safety. Herein, the patient's large size meant that they could not fit on a standard operating table; thus, two tables, one equipped with a Sugita Head Holder to align the patient's nasal corridor with the surgeon, were joined. These modifications improved the operating conditions.

LD placement

Various skull base reconstruction techniques have been developed for using the EEA in skull base lesions to prevent postoperative CSF leakage, which may lead to meningitis and tension pneumocephalus.[6,11] In the literature, although CSF leak rates after EEA were low in both obese and non-obese patients, a small effect of obesity on this risk could not excluded.[4,11] Cohen *et al*. reported that LD may help to prevent postoperative CSF leaks, particularly in patients with obesity.[3,9] However, extreme obesity and increased subcutaneous fat obscure the usual bony landmarks of the supraspinous process, complicating midline identification and increasing the risks of blood vessel or dural puncture, making LD placement challenging.[1] In general, LD placement is performed with the patient in the lateral decubitus position under general anesthesia; however, in patients with severe obesity, midline misalignment is concerning due to the inability to accurately locate the spinous process due to pannus thickness and subcutaneous fat displacement by gravity. In such cases, fluoroscopic guidance can assist in accurate needle placement. Moreover, in patients with obesity, the procedure should be performed with the patient awake and in a sitting position to minimize the misalignment risk and ensure correct placement. In our case, we successfully placed the LD under fluoroscopic guidance with the patient awake and in a sitting position.

CONCLUSION

We present the technical nuances of the EEA for patients with super-super-obesity and highlight our experience in successfully performing endoscopic endonasal surgery in a patient with craniopharyngioma, demonstrating the importance of innovation and problem-solving in overcoming surgical challenges. Adequate multidisciplinary preoperative preparation, anticipation of problems, and preparedness to circumvent complications are mandatory for successful neurosurgery in patients with extreme obesity.

Ethical approval

The Institutional Review Board approved the research/study at the Ina Central Hospital Ethics Committee, number approval number 24-2, dated April 11, 2024.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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