CASE REPORT

Anesthesia Management of a Morbidly Obese Patient in a Nonbariatric Setup Using HFNO: A Case Report

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Abstract

Anesthesia management in obese patients is often challenging due to associated comorbidities like hypertension, dyslipidemia, ischemic heart disease, diabetes mellitus, osteoarthritis, liver disease, asthma, obstructive sleep apnea (OSA), and obesity-hypoventilation syndrome. Obese patients may experience perioperative hypoxemia due to reduced functional residual capacity (FRC) and increased oxygen demand, emphasizing the importance of appropriate oxygenation in improving patient safety. High-flow nasal oxygenation (HFNO) is a relatively newer technique of oxygenation with rapidly increasing applications. It delivers high fraction of inspired oxygen (FiO_2) compared to conventional oxygen delivery systems, with a flow rate of up to 70 L/minute, which matches or even exceeds patients' peak inspiratory flow rate. A 66-year-old female, weighing 160 kg, 150 cm in height, body mass index (BMI) 71.1 kg/m^2, morbidly obese, came with complaints of postmenopausal bleeding and was posted for hysteroscopy with dilatation and curettage. We describe the management of a morbidly obese patient for dilation and curettage (D&C) hysteroscopy in a nonbariatric setup to highlight the effective usage of HFNO and various other challenges faced.

Keywords: Case report, High-flow nasal oxygenation, Morbid obesity, Nonbariatric, Total intravenous anesthesia.

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Introduction

Anesthesia management in obesity is challenging due to associated comorbidities like hypertension, dyslipidemia, ischemic heart disease, diabetes mellitus, osteoarthritis, liver disease, asthma, obstructive sleep apnea (OSA), and obesity-hypoventilation syndrome.[1]

Obese patients may experience perioperative hypoxemia due to reduced functional residual capacity (FRC) and increased oxygen demand, emphasizing the importance of appropriate oxygenation in improving patient safety.[2]

High-flow nasal oxygenation (HFNO) is a relatively newer technique of oxygenation with rapidly increasing applications.[3] It delivers high fraction of inspired oxygen (FiO_2) compared to conventional oxygen delivery systems, with a flow rate of up to 70 L/minute, which matches or even exceeds patients' peak inspiratory flow rate.[2]

We describe the management of a morbidly obese patient for dilation and curettage (D&C) hysteroscopy in a nonbariatric setup to highlight the effective usage of HFNO and various other challenges faced by us.

Case Description

A 66-year-old female, weighing 160 kg, 150 cm in height, body mass index (BMI) 71.1 kg/m^2, with morbid obesity, came with complaints of post-menopausal bleeding. She was posted for hysteroscopy with dilatation and curettage.

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On preanesthetic evaluation, the patient had been hypertensive for 20 years and was on a combination of telmisartan and hydrochlorothiazide. She gave a history of snoring, although she had not been evaluated further for OSA. She was on thyroxine (25 µg) tablet for hypothyroidism for 15 years and was euthyroid. She gave a history of being investigated for lower backache a few years prior, and radioimaging had shown degenerative changes in D11-12, L3-4, and L5-S1. However, she was on conservative management for it.

On examination, her pulse rate was 96/minute regular, and BP was 140/90 mm Hg as measured on the upper limb

using an extralarge lower limb cuff. Her mouth opening was 3 fingers, Mallampati classification was class 4, and thyromental distance was 5 cm. She had a short neck with a heavy jaw and buccal and chin fat. On auscultation, the chest was clear with a peripheral oxygen saturation (SpO_2) of 96–97% on room air. Her effort tolerance was poor, and she was bed-bound for the past 2 years due to obesity.

Her arterial blood gas on room air showed mild hypoxia with CO_2 washout (arterial blood gas—pH of 7.4; partial pressure of CO_2: 27.7, partial pressure of O_2: 59.4, bicarbonate: 23.5, base excess: 1.9, arterial O_2 saturation: 92%).

Other investigations like hemoglobin, complete blood count, thyroid function test, renal function tests, liver function tests, and sugar levels were within normal limits.

Two-dimensional echocardiogram was reported as suboptimal due to poor acoustic window with an ejection fraction of 55–60%.

In the operation theater, as the operating (OT) table was too narrow for her, a larger obstetric labor bed was brought in, which also had the facility to give a lithotomy position. After confirming nil-by-mouth status, electrocardiogram, SpO_2, and noninvasive blood pressure (BP) monitors were attached. The biggest lower limb BP cuff available was used on her upper limb, which was also not adequate for her, causing difficulty in obtaining BP readings. The difficult airway cart was kept ready. O_2 was supplemented with nasal prongs at 3 L/minute. Peripheral intravenous line (IV) 20G was secured on the left upper extremity on the first attempt, although vein visibility was poor. A sequential compression device was not used as the garment size was inadequate, and the expected duration of the procedure was short.

The plan was to administer a subarachnoid block (SAB) in a lateral position using 150 mm Quincke's spinal needle. As the patient had been bedridden, a sitting position could not be given, and a lateral position was chosen. In the absence of lifting equipment, turning the patient was extremely difficult. SAB was technically difficult due to the inability to appreciate landmarks and poor positioning and was unsuccessful despite multiple attempts.

Hence, it was decided to conduct the case under total IV anesthesia (TIVA) with oxygen supplementation with high-flow nasal oxygen (HFNO) 30 L and FiO_2 of 100%. A ramp-up position using multiple pillows was given. IV propofol 50 mg, fentanyl 130 µg, and ketamine 70 mg were all administered in titrated doses. 1 gm of paracetamol IV was given for analgesia. Oxygenation was adequately maintained, and hemodynamics remained stable throughout the procedure, which was completed within 30 minutes. The postoperative period was uneventful.

Discussion

Anesthesia management of morbidly obese patients is challenging, especially in a nonbariatric setup.

Obesity, neck circumference, and OSA are independent predictors of difficult airway. Obesity modifies the dynamics of respiration, which is further enhanced with general anesthesia and lithotomy position. Reduced FRC results in poor oxygen reserve and a shorter period of apnea tolerance before desaturation.[4] Severe OSA occurs in 10–20% of patients with BMI of >35 kg/m^2 and is often undiagnosed.[5]

HFNO is a well-tolerated therapy that has been shown to benefit oxygenation, ventilation, and upper airway patency in a variety of clinical scenarios in both spontaneously breathing and apneic patients.[3,6,7]

The benefits of HFNO include delivery of warm and humidified oxygen at high flow rates matching patients' peak inspiratory flow rate requirement, reduced viscosity of secretions, improved mucociliary clearance, reduced oxygen dilution, increased functional residual capacity (FRC) with positive end-expiratory pressure effect, reduced work of breathing, washout of pharyngeal dead space and better patient compliance.[8,9]

In our case, we used TIVA with the patient breathing spontaneously and HFNO for oxygenation. Throughout the procedure, the saturation was well maintained, with no episodes of desaturation.

A multicentric randomized controlled trial (RCT), the ODEPHI trial in 2021, found HFNO usage during GI endoscopy reduced the incidence of desaturation compared to conventional oxygen therapy.[10] An RCT comparing nasal cannula to HFNO in patients undergoing endoscopic retrograde cholangiopancreatography in the prone position showed that HFNO patients did not have any episodes of desaturation and suggested that HFNO may be the preferred method of oxygen delivery in such procedures.[11] In a large multicentric RCT, HFNO significantly reduced incidence of mild and severe hypoxia in patients undergoing gastroscopy under Propofol sedation with good patient tolerance.[12] Booth et al. showed that spontaneous respiration using IV anesthesia and high flow nasal oxygen could increase the margin of safety in tubeless field surgery.[3]

Our initial plan of anesthesia was SAB due to advantages like minimal airway intervention, avoidance of muscle relaxants and their effect on respiratory mechanics, the minimal requirement for drugs like opioids, reduced postoperative nausea and vomiting, and reduced hospital stay. However, these advantages can be offset by technical challenges in the obese due to difficulty in patient positioning, identifying landmarks, and depth of structures.[13] Despite multiple attempts, SAB could not be administered in our case due to the above reasons. Lumbar ultrasound is not used routinely in our setup, and considering the learning curve associated with achieving competence in it, ultrasound assistance might not have improved our chances of success.[14,15]

We also encountered other practical issues related to bariatric specialty equipment. Most nonbariatric setups are not equipped with automated wide OT tables with higher weight capacity, lifting or transferring equipment, weight-appropriate BP cuffs, extralong spinal epidural needles, and instruments.[16] Extralarge thigh cuff was used on the upper arm of our patient for BP measurement as recommended in

the American Heart Association BP guidelines 2017 for BP measurements in severely obese patients.[17] Alternatively, BP can be measured on the forearm and has been shown to be consistent with intra-arterial measurements.[18]

Conclusion

With the increasing prevalence of overweight and obesity in India,[19] hospitals must adapt to accommodate the needs of this patient population by being equipped with bariatric specialty equipment, including HFNO, to provide safe and quality medical care.

Clinical Significance

The above case report highlights the fact that when faced with a challenging scenario, innovative yet safe utilization of available knowledge and resources for patient care is the need of the hour.

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