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# Perioperative Management of Morbidly Obese Patients: Clinical Advances

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**Abstract:** ***Over recent decades, the global prevalence of morbid obesity (BMI≥35 kg/m²) has risen steadily due to rapid economic development and improved living standards. With the increasing number of bariatric surgeries, anesthesiologists face significant challenges in perioperative management owing to altered physiological states, including elevated body fat percentage and respiratory dysfunction. This review aims to summarize the characteristics of perioperative anesthesia management in morbidly obese patients and propose future therapeutic strategies.***

**Keywords:** Morbid obesity, BMI, Anesthesia management, Sleep-related breathing disorders**.**

## 1. Definition and Epidemiology of Morbid Obesity

Morbid obesity is defined as a body mass index (BMI) exceeding 35 kg/m². BMI is a globally recognized metric used to assess obesity and nutritional status. It is calculated as weight in kilograms divided by height in meters squared [1].

Compared with individuals with a normal BMI, morbidly obese patients demonstrate a higher prevalence of both psychological and organic comorbidities. However, emerging evidence indicates that high BMI does not increase perioperative risk. Paradoxically, some studies have reported lower mortality rates among obese patients compared to their normal-weight counterparts—a phenomenon known as the "obesity paradox" [2]. This hypothesis remains controversial due to the absence of prospective randomized controlled trials and the heterogeneity across study designs. Importantly, clinical outcomes are significantly influenced by fat distribution patterns and overall body composition such as muscle mass. For example, in elderly patients with sarcopenia (age-related muscle loss), body fat percentage may be underestimated despite a stable BMI [3].

## 2. Perioperative Characteristics of Morbidly Obese Patients

The increased body weight of morbidly obese patients presents significant challenges to surgical teams, including limitations related to equipment capacity and positioning. From both medical and anesthetic perspectives, reducing perioperative complication rates while ensuring patient safety has become a critical priority.

### 2.1 Selection of Anesthesia Methods

2.1.1 Preoperative Evaluation

A comprehensive preoperative evaluation should be conducted for morbidly obese patients to determine whether morbid obesity may affect prognosis through anatomical alterations or increased disease-related complications. Patients with visceral adiposity and metabolic syndrome are at high risk for comorbidities such as diabetes, arterial hypertension, atrial fibrillation, and coronary artery disease—conditions that further elevate the likelihood of perioperative complications. Therefore, during preoperative assessment, anesthesiologists should prioritize evaluating organ function and physical capacity. BMI alone should not be the sole determinant for additional investigations or specialized anesthetic techniques [4].

2.1.2 Difficult Airway

Morbidly obese patients often exhibit fat deposition in the facial, pharyngeal, and lingual regions, which can complicate mask ventilation and endotracheal intubation compared to non-obese individuals. However, this association remains a topic of debate. A recent retrospective single-center study involving 45,447 patients found that morbidly obese individuals had significantly higher odds of difficult mask ventilation (OR: 3.785; 95% CI: [3.188-4.493]; $P < 0.001$) [5]. Similarly, a Danish registry-based study reported a significant association between morbid obesity and difficult conventional intubation or intubation failure (OR: 1.34; 95% CI: [1.19-1.51]; $P < 0.0001$) [6].

European preoperative risk assessment guidelines identify high BMI as a risk factor for difficult mask ventilation (>30 kg/m²) and direct laryngoscopy (>35 kg/m²) [7]. Nevertheless, an observational study of 180 patients showed no correlation between difficult airways and BMI when patients were positioned in a "ramped position." Therefore, adopting the ramped position is recommended as a standard practice for morbidly obese patients to improve intubation conditions [8].

2.1.3 Sleep-Disordered Breathing

Obstructive sleep apnea (OSA) is highly prevalent among morbidly obese patients and serves as a risk factor for difficult intubation and increased postoperative complications [9]. Sleep-disordered breathing is characterized by recurrent episodes of nocturnal apnea, leading to hypoxia, disrupted sleep, increased respiratory effort, heightened sympathetic activity, and daytime somnolence [10]. Among morbidly obese patients undergoing bariatric surgery, the prevalence of sleep-disordered breathing ranges from 60% to 90% [11],

whereas it occurs in only 2% to 26% of normal-weight individuals [12]. In an observational study of 279 morbidly obese patients (mean BMI: 44.2 ± 6.4 kg/m²) who underwent polysomnography before bariatric surgery, only 13.3% had a prior diagnosis, while 69.9% were newly diagnosed; notably, 40.4% exhibited severe sleep-disordered breathing [13].

Consequently, perioperative management strategies addressing sleep-disordered breathing should be considered applicable to most morbidly obese patients. Standardized screening for sleep-disordered breathing risk must be integrated into routine preoperative preparation for obese patients.

## 2.2 Preoperative Medication and Instructions

Benzodiazepines should be avoided in obese patients preoperatively due to the increased risk of apnea. Greater emphasis should be placed on using medications with minimal respiratory depressant effects, such as clonidine, which effectively alleviates preoperative anxiety without compromising respiratory function. The standard preoperative fasting durations are 6 hours for solid foods and 2 hours for clear fluids.

# 3. General Anesthesia Induction and Maintenance

### 3.1 Preoxygenation and Induction of General Anesthesia

Whether rapid sequence induction without manual ventilation should be used in morbidly obese patients to reduce the risk of aspiration remains a subject of debate. Although intra-abdominal pressure is indeed elevated in obese patients, existing studies have shown that high intra-abdominal pressure does not necessarily increase the risk of aspiration [14]. However, a large meta-analysis involving 460,984 patients found that the prevalence of gastroesophageal reflux is 1.7 times higher in obese individuals compared to those of normal weight [15]. In clinical practice, a “modified rapid sequence induction” technique is commonly employed for general anesthesia in obese patients, aiming to minimize the period during which spontaneous breathing or assisted ventilation is unavailable, thereby preventing hypoxia. This approach includes thorough preoxygenation using a tightly fitting mask ($FiO_2$: 1.0, PEEP 5-10 cm $H_2O$) while the patient is in a semi-recumbent position, followed by anesthesia induction with a high dose of rocuronium to achieve rapid muscle relaxation. Succinylcholine is generally not recommended because it increases oxygen consumption during muscle depolarization. Mask ventilation is performed only briefly until complete muscular relaxation is achieved and intubation can proceed. In emergency scenarios, video laryngoscopy is preferred for initial intubation [16].

### 3.2 Respiratory Physiology and Intraoperative Ventilation Strategies

Obese patients are at an increased risk of pulmonary complications, including asthma, obstructive sleep apnea, and pulmonary hypertension. These comorbidities frequently contribute to impaired lung function, characterized by reduced pulmonary compliance and decreased functional residual capacity [17]. Consequently, difficulties in perioperative ventilation or intubation may rapidly escalate into life-threatening situations.

Currently, there is no consensus on the optimal ventilation strategy for obese patients. Excessive tidal volumes may cause structural lung injury—referred to as volutrauma—that resembles the pathophysiology seen in acute respiratory distress syndrome (ARDS) [18]. While excessively high positive end-expiratory pressure (PEEP) levels may lead to barotrauma and hemodynamic instability, appropriate use of PEEP remains crucial for preventing atelectasis. A recent meta-analysis reported that volume-controlled ventilation combined with high PEEP (≥10 cm $H_2O$) and recruitment maneuvers improves gas exchange and reduces atelectasis formation [19]. Conversely, a large prospective randomized trial found no statistically significant difference in the incidence of perioperative respiratory complications between high PEEP (12 cm $H_2O$) and low PEEP (4 cm $H_2O$) in obese patients.

During emergence from anesthesia, extubation should be delayed until the patient is fully awake, responsive to verbal commands, and capable of maintaining effective spontaneous breathing. Residual neuromuscular blockade must be ruled out using a peripheral nerve stimulator and, if present, pharmacologically reversed.

### 3.3 Drug Dosage

Due to the general lack of prospective randomized studies, reliable recommendations regarding anesthetic dosing in obese patients remain unavailable. Maintaining general anesthesia based on actual body weight in obese patients carries a risk of overdose, while inadequate dosing must also be avoided to prevent intraoperative awareness.

Compared to total intravenous anesthesia (TIVA), the pharmacokinetics of inhaled anesthetic agents are only minimally altered, thereby reducing the risk of intraoperative awareness [20]. Although desflurane offers superior controllability and faster wash-in/wash-out rates than sevoflurane, its significant environmental impact necessitates cautious use in low-flow anesthesia. Given the high incidence of opioid-related respiratory depression, current guidelines recommend limiting opioid use whenever possible. Alternatives include multimodal analgesia with lidocaine or ketamine, combined with regional anesthesia techniques.

### 3.4 Prevention of Postoperative Nausea and Vomiting

Risk factors for postoperative nausea and vomiting include being female, perioperative use of opioids, surgery lasting more than one hour, and the use of volatile anesthetics. Multimodal prevention of postoperative nausea and vomiting should involve the combined administration of two or more intravenous drugs, such as long-acting corticosteroids (8 mg dexamethasone), 5-HT3 receptor antagonists (8 mg ondansetron), butyrophenones (1.25 mg droperidol), or 62.5 mg diphenhydramine [21].

### 3.5 Regional Anesthesia

In obese patients, regional anesthesia techniques (epidural anesthesia, spinal anesthesia, peripheral nerve block) are generally considered superior to general anesthesia [22]. However, there is a lack of relevant controlled randomized studies addressing this issue. In many cases, appropriate regional anesthesia can facilitate early mobilization, reduce systemic opioid consumption, and minimize associated side effects. Furthermore, regional anesthesia helps avoid pulmonary complications, difficulties with intubation, and other potential risks.

For obese patients undergoing general anesthesia, it is advisable to supplement with local anesthesia by administering local anesthetics at wound infiltration or cannula incision sites. This combined approach can reduce the amount of anesthetics and opioids required during and after surgery, thereby lowering the risk of potential perioperative complications.

## 4. Postoperative Management

Obese patients face an increased risk of respiratory complications, which requires special attention during postoperative care. In an observational study involving 105 participants, the incidence of respiratory complications was 8.57% among patients with a BMI of 35-55 kg/m², rising to 20% in those with a BMI ≥55 kg/m². Following bariatric surgery, a double-blind, prospective, single-center study reported that all participants experienced hypoxic episodes (defined as peripheral oxygen saturation <90% for >30 seconds) despite receiving supplemental oxygen [23]. Therefore, postoperative monitoring should be extended for at least 24 hours in obese patients to prevent severe respiratory events.

Moreover, long-acting opioids and sedatives should be used cautiously even after surgery to avoid prolonged respiratory depression and airway collapse. Early postoperative mobilization is recommended to improve cardiopulmonary function and reduce the risk of thromboembolic events [24].

## 5. Conclusion

Obesity has become a globally prevalent condition, imposing persistent physical and psychological burdens along with multisystem complications. Reducing its prevalence remains a pressing public health challenge. Bariatric surgery is now widely regarded as an effective weight-loss strategy. However, the altered physiological functions in obese patients necessitate safe and stable perioperative management—a key focus for anesthesiologists. This review summarizes current advances in perioperative management for obese patients, offering clinicians new insights.

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