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Ambulatory Anaesthesia Management for Obese Patients

Obez Hastalar için Günübirlik Anestezi Uygulamaları

ABSTRACT
Standard operating room conditions may not be provided in areas where ambulatory anesthesia is applied. For this reason, the infrastructure of the center should be taken into account when evaluating obese patients. Obesity is not an independent risk factor. Accompanying comorbidities are decisive in the development of perioperative complications. Obese patients should be evaluated for cardiac, pulmonary, endocrine disorders, and Obstructive Sleep Apnea Syndrome. Particular attention should be paid when evaluating morbidly obese (Body Mass Index> 40 kg / m2) patients. Comorbidities, not Body Mass Index alone, should be decisive in terms of suitability for outpatient surgery. Super morbid obese patients with Body Mass Index> 50 kg / m2 can be taken to selected ambulatory surgery if there is no accompanying comorbidity. No relationship was found between Body Mass Index and difficult airway. However, it was stated that difficult mask ventilation and intubation were found in patients with a high mallampati score and neck circumference >50 cm. Therefore, it may be helpful to look at the neck circumference of obese patients preoperatively. The drugs to be used should be adjusted according to the ideal body weight and used by titration. It is recommended to use wakefulness (Bispectral Index Monitoring) monitoring methods when adjusting the anesthetic dose for obese patients. Non-opioid analgesia methods should be preferred. Opioids should be preferred as rescue analgesics. If possible, regional anesthesia and analgesia methods should be applied. Anatomical difficulties should be considered in regional anesthesia and analgesia applications. Hospitalization should be considered in surgeries longer than three hours. In surgeries longer than six hours, patients should be hospitalized.

Key Words:
Anesthesia, Ambulatory, Obesity, Outpatient

ÖZ
Günübirlik anestezi uygulanan alanlarda standart ameliyathane koşulları sağlanamayabilir. Bu nedenle obez hastaları değerlendirirken merkezin altyapısı da dikkate alınmalıdır. Obezite, bağımsız bir risk faktörü değildir. Eşlik eden komorbiditeler perioperatif komplikasyonların gelişiminde belirleyicidir. Obez hastalar kardiyak, pulmoner, endokrinolojik açıdan ve Obstrüktif Uyku Apne Sendromu açısından değerlendirilmelidir. Morbid obez (Vücut Kitle İndeks> 40 kg/m2) hastaları değerlendirirken özellikle dikkat edilmelidir. Ayaktan cerrahiye uygunluk açısından tek başına Vücut Kitle İndeks değil, komorbiditeler belirleyici olmalıdır. Vücut Kitle İndeks> 50 kg/m2 olan süper morbid obez hastalar eşlik eden bir komorbidite yoksa seçilmiş ayaktan cerrahiye alınabilir. Vücut Kitle İndeks ile zor hava yolu arasında ilişki bulunamamıştır.

Ancak mallampati skoru yüksek ve boyun çevresi >50 cm olan hastalarda zor maske ventilasyonu ve entübasyonuna rastlandığı belirtildi. Bu nedenle obez hastaların ameliyat öncesi boyun çevresine bakmak faydalı olabilir. Kullanılacak ilaçlar ideal vücut ağırlığına göre ayarlanmalı ve titrasyon ile kullanılmalıdır. Obez hastalarda anestezi dozu ayarlanırken uyanıklık (Bispektral İndeks Monitörizasyonu) izleme yöntemlerinin kullanılması önerilir. Opioid içermeyen analjezi yöntemleri tercih edilmelidir. Kurtarma analjezikleri olarak opioidler tercih edilmelidir. Mümkünse bölgesel anestezi ve analjezi yöntemleri uygulanmalıdır. Rejyonel anestezi ve analjezi uygulamalarında anatomik zorluklar göz önünde bulundurulmalıdır. Üç saatten uzun süren ameliyatlarda hastanede yatış düşünülmelidir. Altı saatten uzun süren ameliyatlarda hastaların hastaneye yatırılması gerekir.

Anahtar Kelimeler:
Anestezi, Ayakta tedavi, Obezite, Günübirlik

INTRODUCTION
Obesity is a disease characterized by excessive accumulation of fat in the body, the prevalence of which continues to increase every year (1,2). Obesity is defined as a body mass index greater than 30 kg m2 [BMI = weight (kg)/height2 (m2)]. Additional definitions of obesity are given in Table (I,II).

Table I. Shows additional definitions of obesity

BMI Range	Classification
25 < BMI < 30	Over-weight
30 < BMI < 35	Obesity class 1
35 < BMI < 40	Obesity class 2
40 < BMI < 50	Obesity class 3 / Morbid Obese
BMI > 50	Super Morbid Obese
BMI > 70	Ultra Obese

BMI: Body Mass Index

In 2016 there were 650 million people, about 12% of the estimated world population, classified as obese (3). Super morbid obese people (body mass index (BMI) >50 kg/m2) constitute the fastest-growing component of obese patients in the United States (2,4).

Heart disease, hypertension, coronary artery disease, obstructive sleep apnea (OSAS), diabetes, lung disorders, cancer, stroke risk, renal and thromboembolic complications, difficulty in glucose control, other endocrine and metabolic problems are accompanying obesity. Furthermore, they are associated with high morbidity and mortality during surgery (1,3,5). The incidence of anesthesia-related severe intraoperative events related to obesity is approximately 0.9%. The risk of death, venous thromboembolism, and long-term hospital stay increases linearly with the severity of obesity (6).

The increase in obesity prevalence every year presents a multifaceted problem in patient safety and rapid discharge home (1,3). Some of these problems indicate that obesity alone does not increase cardiovascular risk and that the increased risk may be related to comorbidities (5,6). The risk of both intraoperative and post-operative respiratory complications rises with obesity. In addition to hemodynamic instability, difficulties may be encountered in monitoring respiratory parameters, providing intravenous access, airway management leading to hypoxia, and the risk of position-related nerve damage may increase. Longer operation time, more blood loss, increased need for reoperation, impaired wound healing, and increased risk of wound infection are possible consequences (3-6).

Preoperative Evaluation
Obesity-related comorbidities can influence cardiovascular, respiratory, and metabolic systems (2). Patients should be evaluated for comorbidities, including high blood pressure, cardiovascular disease, coronary artery disease, respiratory disease, sleep apnea syndrome, endocrine disorders (especially diabetes mellitus), and an elevated risk of deep vein thrombosis (1,7). More careful evaluations should be made regarding potential comorbidities associated with a BMI greater than 40 kg/m2 (2). Obese patients with a BMI of 30-40 kg/m2 do not have an increased complication rate for ambulatory surgeries compared to regular patients. Although there is no definitive information regarding morbid obesity (BMI> 40 kg/m2), it is believed that patients may be prone to higher complication rates as BMI increases. Not only BMI but the presence of comorbidities should also be decisive in terms of suitability for ambulatory surgery (3).

Cardiovascular System
Considerations should be carried out regarding undiagnosed cardiopulmonary diseases due to obesity. Therefore a detailed history besides physical examination should be performed. Furthermore, cardiac function and functional capacity should be evaluated comprehensively (3,6). Depending on the severity of cardiovascular disease, patients may not be suitable candidates for ambulatory surgery due to the increased possibility of complications (3).

Obesity is primarily associated with hypertension (HT) due to increased plasma volume and cardiac output (2). The prevalence of HT can be caught around 50% in obese individuals and approximately 60% in severely obese (8). The most common change in cardiac morphology due to obesity is increased left ventricular (LV) mass, including LV hypertrophy (LVH). Bioactive mediators that result in atherosclerosis are released from adipose tissues, lipids, coagulation factors, fibrinolysis, and endothelial inflammatory dysfunction (9). However, HT is associated with activation of the adipocyte's renin-angiotensin-aldosterone system. This results in increased peripheral vascular resistance and sympathetic tone. Thus, through the direct effects of angiotensin II on the LV myocardium, it may contribute to left ventricular hypertrophy. Hyperleptinemia and leptin resistance were associated with left ventricular hypertrophy, while insulin resistance with hyperinsulinemia increased LV mass. A 50% increase in the risk of atrial fibrillation has been associated with sinoatrial node dysfunction and increased dysrhythmia due to fat infiltration of the conduction pathways (2,8).

Obesity cardiomyopathy is defined as heart failure that develops primarily due to severe obesity (8). Morbid obesity can lead to cardiomyopathy in the absence of coronary artery disease (7). Right heart pressures and pulmonary vascular resistance may be higher in class II-III obese patients compared to regular weight patients (8). Other considerable issues are; cardiovascular sequelae, congestive heart failure, dilated cardiomyopathy, pulmonary hypertension, high right heart pressures, and increased pulmonary vascular resistance. Left ventricular diastolic dysfunction is frequently seen in obese individuals, especially in extreme obese and hypertensive obese individuals (2,8). An increase of 5 kg/m2 in BMI increases the risk of cardiovascular death, a 10% increase in hemorrhagic stroke, and a 49% increase in hypertension. Furthermore, the increase in BMI; increases the risks of heart failure, coronary heart disease (CHD), atrial fibrillation, hemorrhagic stroke, ischemic stroke, hypertension, aortic valve stenosis, pulmonary embolism, and venous thromboembolism (9,10).

Ambulatory surgeries have a low perioperative risk for cardiac complications (< 1%). Therefore, the electrocardiogram should be evaluated in patients with limited functional capacity and few risk factors for perioperative cardiovascular morbidity (heart disease, congestive heart failure, cerebrovascular disease, insulin therapy, and serum creatinine >2 mg/dL). Cardiac enlargement or abnormal pulmonary vascularity should be evaluated on a chest X-ray. Left bundle branch block is not expected in uncomplicated obesity, and the underlying cause should be investigated. Stress tests and echocardiography may be indicated in patients with three or more risk factors (7). Non-invasive diagnostic cardiac techniques used to evaluate left ventricular diastolic function include Doppler echocardiography, tissue Doppler echocardiography, radionuclide left ventriculography, and cardiac magnetic resonance imaging (MRI) (8).

Respiratory system

Depending on obesity, the soft tissue weight increases, and lubrication occurs on the chest wall. Thus, compliance decreases due to increased pulmonary blood flow (2). While total lung capacity, functional residual capacity, expiratory reserve volume, and residual volume decrease with obesity, intra-abdominal pressure and the risk for atelectasis increases (2,11). Depending on the changes in smooth muscle structure, hyperreactivity increases, and airway diameter decreases (2). When moderate and deep sedation is applied with the prone position, the risk of hypoxia and apnea increases due to limited reserve, increased oxygen consumption, and pulmonary mechanical effects of the lungs (6).

The major comorbidity that can be seen in 70% of obese patients (over 40 kg/m2) is obstructive sleep apnea syndrome (OSAS), and it is undiagnosed in approximately 80% (2,6,7). OSAS is associated with adverse long-term health problems, perioperative risk, respiratory complications, and increased risk for ambulatory surgery (7,12). Predominantly respiratory complications can be seen in the coexistence of obesity and OSAS. Most patients can be treated safely on an ambulatory basis as long as the comorbidities are well controlled. All obese patients planning for surgery should be evaluated for OSAS by performing the STOP-BANG questionnaire (Table II).

Table II. STOP-BANG Questionnaire (2)

Snoring	Loud snoring (More noise than speaking or being heard through a closed door)
Tired	Do you feel tired, drowsy, exhausted all day long? Does he fall asleep during the day?
Observed	Has anyone observed you stop breathing or choke or gasp while you sleep?
Blood pressure	Do you have hypertension or are you receiving treatment for HT?
BMI	BMI ≥ 35 kg m^2
Age	≥ 50 years
Neck	Circumference (measured around Adam's apple) > 43 cm for Men, > 41 cm for Women
Sex	Male

BMI: Body Mass Index

A score of 0-2 indicates low probability, 3-4 indicates moderate risk, and 5-8 indicates high-risk patients for undiagnosed OSAS (2,6,7,11,12). Post-operative events (such as pulmonary complications, reintubation, and cardiac arrhythmias) were four times higher in patients with high-risk OSAS than those with low-risk OSAS (3). One factor that increases the risk in this group of patients is respiratory complications due to increasing the demand for narcotics post-operatively (12). Excessive opioid use should be avoided, and a non-opioid approach should be evaluated (6). Obese patients with OSAS scheduled for ambulatory surgery should be reviewed for other comorbidities and use a continuous positive airway pressure (CPAP) machine after post-operative discharge. When these conditions are established, suitable patients can receive ambulatory treatment (2,7).

Metabolic System

Metabolic syndrome consists of four features these are; hypertension, obesity, abnormal lipid levels (high triglyceride and low high-density lipoprotein), and hyperglycemia due to insulin resistance. Perioperative complications and mortality rates are higher in patients with untreated disorders (2). A 65% increase in the risk of acute kidney injury (AKI) has been noticed in obese patients within 30 days of surgery (11).

Obesity correlates with Type 2 diabetes mellitus (DM). Adults with a BMI ≥ 40 kg m2 are seven times more likely to have diabetes. It is estimated that 63% of obese people have Type 2 DM, and 90% have high blood sugar levels. DM causes tissue remodeling that affects elastin and collagen in the airways by increasing smooth muscle tone. 25% of the patients do not know their glycemic status. Therefore, glycemic levels should be monitored perioperatively (2,11). In their study, Sudy et al., showed that the intrinsic mechanical abnormalities caused by diabetes in the respiratory tract in obese individuals are balanced by hypoxic pulmonary vasoconstriction, which preserves the intrapulmonary shunt fraction and oxygenation ability of the lungs (13).

Airway management

The accumulation of adipose tissue causes changes in airway anatomy and respiratory function. It causes decreased pharyngeal area, obstructive sleep apnea, restriction in neck flexion, narrow jaw opening, tongue enlargement, reduction in functional residual capacity, decrease in alveolar oxygen reserve, and increase in O2 consumption (14). Although it is not an independent risk factor for difficult airway in obese patients, there is a correlation between high mallampati score and wide neck circumference and correspondingly difficult intubation (7). Preoxygenation is recommended in morbidly obese patients because of the possibility of a difficult airway and the increased risk of hypoxemia. As BMI increases, desaturation develops more quickly in the apneic condition. Preoxygenation can be improved with head-up position and continuous positive airway pressure (CPAP)/ Bi-level positive airway pressure (BIPAP) application. With the sniffing position, the difficulty in intubation can be reduced. In obese patients, video laryngoscopy is better than laryngoscopy in terms of success rate and intubation time and provides a better view of the glottis (7,14). However, despite the evidence showing the benefits of using video laryngoscopy, direct laryngoscopy is still more widely used (15).

Gill et al., conducted a study on the use of laryngeal mask airway (LMA) in obese patients (16). The study stated no increase in respiratory tract problems such as aspiration risk, laryngospasm, and inadequate ventilation compared to normal-weight patients. They also indicated that LMA could safely be used in obese patients.

Shaw et al., demonstrated that obesity was associated only with minor airway events (desaturation, inadequate ventilation with supraglottic airway devices), not major airway complications (difficult intubation, etc.) (15). Babayigit et al., reported that possible airway problems and complications in bariatric surgery are similar to non-bariatric surgeries (17). They found that an increase in neck circumference (>50 cm) was a more meaningful indicator than body mass index in predicting difficult intubation and ventilation.

The risk of atelectasis increases with obesity. There are no clear data on the optimal positive end expiratory pressure (PEEP) level in obesity. Recruiting maneuvers and PEEP applications can improve alveolar gas exchange and lung mechanics. Low tidal volume and personalized PEEP settings can reduce post-operative atelectasis. Obese patients may also need higher protective driving pressure (the difference between plateau pressure and PEEP) due to low lung capacity or intraoperative physiological changes (18).

The PEEP level for obese patients was much higher than that routinely used and not associated with BMI alone (19). Although individualized PEEP was found to be successful in intraoperative lung mechanics and oxygenation, it was observed that it did not improve post-operative oxygenation (19-21). With individualized PEEP, larger volumes of fluid and higher doses of vasopressors were required (19). However, general norepinephrine doses were low, so it may not cause a problem in most patients, but high PEEP values should be avoided in those with significant right heart failure (21).

Pressure-controlled ventilation can promote more homogeneous ventilation, reducing alveolar overswelling and improving oxygenation. Volume-controlled ventilation can reduce the risk of post-operative pulmonary complications by providing better tidal volume control during surgery that affects chest wall compliance (18).

Anesthetic Drugs

Anesthesia drug doses are calculated according to body weight. The drugs' pharmacokinetics (clearance, elimination, and distribution volumes) vary due to the more extensive vascular fat tissue in obese patients (2). There is uncertainty about appropriate dosing in obese patients (7). However, lean, ideal, and correct bodyweight should be calculated, and drug doses can be delivered by calculating weight according to the anesthesia drug scales given in Table III (2).

Table III. Calculations for Pharmacology (2)

Ideal Body Weight: Patient's normal lean fat mass ratio IBW= Height (cm) - 105 (Female) IBW= Height (cm) - 100 (Male)		
Lean Body Weight (LBW): Patient's lean body weight Male = 9270 x Total body weight (TBW) / 6680 + (216 x body mass index) Female = 9270 x TBW / 8780 + (244 x body mass index)		
Adjusted body weight (ABW): This allows for increased lean body weight and increased volume of distribution in obese individuals. ABW = IBW + 0.4 (TBW – IBW)		
DRUG SCALES FOR ANESTHESIA		
Lean Body Weight	**Ideal Body Weight**	**Total Body Weight**
Propofol (induction)	Propofol (Infusion for maintenance of anesthesia)	Succinylcholine
Thiopental	Antibiotics	
Fentanyl	Alfentanil	
Rocuronium	Low molecular weight heparin	
Atracurium	Neostigmine	
Vecuronium		
Morphine		
Paracetamol		
Bupivacaine		
Lidocaine		

Most ambulatory procedures can be performed with sedation/analgesia. The most commonly used agent is midazolam which should be used with caution in terms of respiratory depression (7). It is safer to perform induction in the operating room rather than the anesthesia room. In addition to standard monitoring, neuromuscular and bispectral index (BIS) monitoring is essential. Moreover, capnography follow-up should be performed to detect early apnea in patients receiving sedation (2,7). There is no ideal anesthesia technique for morbidly obese patients; the aim is to optimize oxygenation, ventilation, and

analgesia in the post-operative period (22). Propofol is preferred in procedures requiring deep sedation. However, the association of obesity with OSAS increases respiratory tract complications, and desaturation may ocur (7). The risk of respiratory depression increases with obesity, OSAS, male gender, American Society of Anesthesiologists (ASA) >3, and age. Therefore, drugs should be used by titration. Since ketamine does not reduce upper respiratory tract muscle activity, fewer respiratory tract complications develop; therefore, its combination with propofol is preferred. In addition, dexmedetomidine can be preferred due to the low incidence of respiratory tract complications. It has been found that the airway is better protected when dexmedetomidine and ketamine are used together (7).

Obesity studies have concluded that desflurane and sevoflurane have a faster recovery and early extubation than isoflurane and propofol. While some studies recommend propofol-based anesthesia, other studies remarkably suggest the use of desflurane (23). Some studies indicated that desflurane has faster recovery, while other findings did not show a difference in comparing desflurane and sevoflurane. Moreover, patients with propofol and dexmedetomidine had less post-operative nausea and vomiting (2,7). Demirel I. et al., compared desflurane and total intravenous anesthesia (TIVA), (propofol and remifentanil) infusion for morbidly obese patients (22). They found that cognitive functions improved more rapidly besides a faster post-operative recovery in the TIVA group. In a study comparing TIVA (propofol and dexmedetomidine together) and desflurane, lower heart rate and blood pressure were observed in the TIVA group.

In contrast, less pain, nausea, vomiting, and side effects were observed in the post-operative period (23). It has been observed that the potency and sensitivity of propofol are increased in morbidly obese patients. Therefore, administration of propofol induction dose based on lean body weight instead of total body weight has been shown to cause less cardiovascular depression and provide appropriate intubation. Accordingly, the induction dose was found to be 2.310-3.567 mg/kg based on lean body mass (24,25). The dosage administration of propofol according to lean body mass and the amount is given according to BIS monitoring were compared. It was seen that an additional amount of the drug should be administered to the drug dose given according to the lean body mass. For this reason, propofol induction and maintenance doses are controversial. It should be administered by monitoring the depth of anesthesia (BIS) in morbidly obese patients (2,26).

Intraoperative multimodal analgesia should be performed. The general recommendation is to use opioids as rescue analgesics. Opioid administration should be limited as it may increase post-operative respiratory complications. Therefore, paracetamol, non-steroidal anti- inflammatory drugs, and local anesthetic infiltrations can be used as alternatives. In addition, dexamethasone may benefit post-operative pain, nausea, and vomiting. However, intermittent hypoxia and sleep disruption was seen in OSAS may cause hyperalgesia and increase the need for analgesics. Non-opioid analgesia has been used more and more in recent years. Non-opioid drugs; lidocaine, dexmedetomidine, ketamine, and magnesium can be used alone or in combination. However, since the side effects of these drugs have not been adequately evaluated, their risks and benefits should be considered (2,7). In a study conducted on morbidly obese patients undergoing laparoscopic gastric bypass surgery, after induction, a bolus of 0.3 mg/kg of ketamine based on ideal body weight was administered, followed by 0.2 mg/kg/hour ketamine infusion continued for up to 24 hours. It has been shown that perioperatively ketamine infusions significantly reduce opioid consumption (27). Post-operative use of dexmedetomidine for post-operative analgesia in bariatric surgery has been shown to significantly reduce opioid consumption in 24 hours and cause less nausea and vomiting. Therefore, dexmedetomidine is a good alternative for multimodal analgesia in high-risk patients such as morbidly obese (28).

Intraoperative hyper- or hypovolemia administration in obese patients is associated with worse outcomes. Individualized targeted fluid therapy outcomes and tissue oxygenation are better in obese patients. Colloid fluids can stay in the intravascular space longer than crystalloid fluids, leading to hemodynamic stability, tissue perfusion, and oxygenation (18).

Neuromuscular Blockade

Since neuromuscular muscle relaxants (hydrophilic) and induction agents are distributed centrally without redistribution, dose adjustment should be made by calculating lean body mass. Unlike other drugs, succinylcholine is the only drug that should be administered according to total body weight due to increased plasma pseudocholinesterase and extracellular volume (2). Due to the risk of residual neuromuscular blockade, neuromuscular blockers should be reduced and avoided if possible. If used, it should be reversed at the end of surgery. According to ideal body weight, Rocuronium, vecuronium, and atracurium should be given according to ideal body weight. In a study comparing sugammadex and neostigmine in morbidly obese patients, residual blockade and the risk of post-operative nausea and vomiting were lower with sugammadex. Although it is suggested that the dose of sugammadex should be given according to total body weight (TBW) in obese patients, some studies show that the dose of sugammadex in morbidly obese patients can be TBW + 40% (2,7). However, in the study of Horrow et al., they showed that the sugammadex dose based on total body weight had a lower risk of decurarisation than the ideal body weight dose, regardless of the depth neuromuscular block or neuromuscular blocking agents (NMBA) used, and allowed faster extubation (29). In the study of Mostoller et al., sugammadex is recommended according to total body weight (30).

Regional Anesthesia for Obese Patients

Regional anesthesia techniques can be used in ambulatory anesthesia in upper and lower extremity surgeries. Thus, besides the airway problems that may occur, the side effects of anesthetic agents, neuromuscular blockade, and opioids are avoided. It also reduces the need for opioids by providing post-operative pain control. However, the block failure rate is 1.62 times higher due to anatomical difficulties. In morbidly obese patients, the intrathecal dose of bupivacaine (BMI >40) is similar to that of regular BMI patients (31). Sitting is recommended for obese patients in neuraxial anesthesia applications (2,7).

Post-operative Considerations

In the postanesthesia care unit (PACU), breathing activity increases in obese patients and should be considered regarding atelectasis and respiratory complications. It should be followed with pulse oximetry, and patients should lie in a semi-sitting position with their heads elevated to reduce airway obstruction (7,18). In the case of opioid use in patients with obesity and OSAS, airway obstruction due to pharyngeal laxity due to pharyngeal muscle weakness is the most common complication of PACU. Therefore, opioid-sparing analgesic approaches should be used (7,18,32). Oxygen support can be applied until the initial saturation value is reached in room air. However, there are concerns that it may suppress hypoxic arousal, increase the duration of apnea attacks, cause respiratory depression and increase carbon dioxide retention.

On the other hand, in the study conducted on OSAS patients, it was shown that the risk of apnea and hypercarbia did not increase. It has been reported that CPAP/BiPAP application is beneficial in patients with post-operative hypoxemia (oxygen saturation <90%). Use of high-flow nasal oxygen instead of CPAP/BiPAP may also be helpful. However, patients who need CPAP or high-flow nasal oxygen administration are not suitable for day-to-day procedures. It is recommended that they be treated as inpatients (7,18). In their study, Gabriel et al., found five conditions that increase the length of stay in PACU; morbid obesity, hypertension, type of surgery, type of anesthesia, and planned case duration (32).

Obesity alone is not a contraindication for outpatient surgery. The studies found the BMI value associated with the risk of readmission to the hospital after discharge as ≥45,7 kg/m2. In addition to BMI, patient comorbidity and surgical factors should also be considered (7). However, in the study by Hajmohamed et al., the probability of early rehospitalization was found to be the same in super morbidly obese patients (BMI ≥50 kg/m2) compared to morbidly obese patients (BMI ≥40 kg/m2) (4). In addition, they concluded that there is no increase in the risk of early post-operative complications at home after discharge in super morbidly obese patients who meet the discharge criteria. Similarly, Vertosick et al., conducted a study of 13957 patients (5). Although there was a slight difference between BMI and post-operative results, there was no significant difference between BMI and length of hospital stay, readmission, and complications. In another study examining 235 patients, there was no correlation between BMI and unplanned readmission. Although conflicting studies have been reported, appropriate selection of patients with high BMI, morbid or super-morbid obesity after considering other comorbidities may increase the success of ambulatory surgery (3,4).

There was no significant increased risk of complications with less than 3 hours of operation time. However, an increase in morbidity of 21% was observed for every hour of a surgery over 3 hours. Although there is no exact maximum time for outpatient surgery, hospitalization for more than 6 hours is recommended (12). Standard discharge criteria can determine the time to discharge from PACU (18). Enhanced recovery after surgery (ERAS) recommendations for post-operative care in bariatric surgery are given in Table IV.

Table IV. ERAS suggestions for post-operative care in bariatric surgery (18)

ELEMENTS	SUGGESTION	EVIDENCE LEVEL	RECOMMENDATION
Post-operative oxygenation	*Patients with OSAS with or without complications should be placed in a semi-sitting position with elevated heads and oxygen support.* *Follow-up of both groups after PACU should be done in a surgical ward.* *In the presence of signs of respiratory distress, it should be treated with non-invasive positive pressure ventilation and maintained oxygenation using a low threshold.*	Oxygen treatment: Low Post-operative position: High	Strong
	Patients with OSAS receiving CPAP treatment at home should use their equipment immediately after surgery.	Moderate	Strong
	Patients with obesity hypoventilation syndrome (OHS) are at higher risk for respiratory adverse events. *Post-operative BiPAP/NIV should be freely considered in the immediate post-operative period, especially in hypoxemia.*	Low	Strong
Thromboprophylaxis	*Thromboprophylaxis should include mechanical and pharmacological measures.* *Doses and duration of treatment should be individualized.*	High	Strong
Early post-operative nutritional care	*A clear liquid meal regimen can usually be started a few hours after surgery*	Moderate	Strong
	All patients should have access to a comprehensive dietetic assessment of the macronutrient and micronutrient content of the diet based on the surgical procedure and the patient's nutritional status, with the support of counseling.	Moderate	Strong
	Patients and healthcare professionals should be aware of thiamine deficiency, especially in the early post-operative period.	Low	Strong
Vitamin and mineral supplement	*It is necessary to monitor lifelong vitamin, mineral supplements, and nutritional habits with biochemical parameters.*	High	Strong
Proton pump inhibitor (PPI) prophylaxis	*PPI prophylaxis should be considered for at least 30 days after Roux-en-Y gastric bypass surgery.*	Roux-en-Y gastric bypass: Moderate	Strong
	There is insufficient evidence to recommend PPI prophylaxis for sleeve gastrectomy surgery, but reported a high incidence of gastroesophageal reflux after this procedure, it may be considered at least 30 days after surgery.	Sleeve gastrectomy: Very Low	Weak
Gallstone prevention	*Ursodeoxycholic acid should be considered six months after bariatric surgery in patients without intraoperative gallstones.*	Moderate	Strong

CONCLUSION

Standard operating room conditions may not be provided in areas where ambulatory anesthesia is applied. For this reason, the infrastructure of the center should be taken into account when evaluating obese patients. Obesity is not an independent risk factor. Accompanying comorbidities are decisive in the development of perioperative complications. Obese patients should be evaluated for cardiac, pulmonary, endocrine, and OSAS. Particular attention should be paid when evaluating morbidly obese (BMI> 40 kg / m2) patients. Comorbidities, not BMI alone, should be decisive in terms of suitability for outpatient surgery.

Super morbid obese patients with BMI> 50 kg / m2 can be taken to selected ambulatory surgery if there is no accompanying comorbidity. Although no relationship was found between BMI and difficult airway. However, it was stated that difficult mask ventilation and intubation were found in patients with a high mallampati score and neck circumference >50 cm. Therefore, it may be helpful to look at the neck circumference of obese patients preoperatively.

The drugs to be used should be adjusted according to the ideal body weight and used by titration. It is recommended to use wakefulness (BIS) monitoring methods when adjusting the anesthetic dose for obese patients. In addition to standard monitoring, BIS, Capnograph, and neuromuscular monitoring should be performed. Particularly muscle relaxants should not be used as much as possible; if necessary, sugammadex should be administered at the end of the operation. Sugammadex should be given by calculating the total body weight.

To avoid opioid use, non-opioid analgesia methods should be preferred. Opioids should be preferred as rescue analgesics. If possible, regional anesthesia and analgesia methods should be applied. Anatomical difficulties should be considered in regional anesthesia and analgesia applications.

Hospitalization should be considered in surgeries longer than three hours. In surgeries longer than 6 hours, patients should be hospitalized. If they are to be discharged, obese patients with OSAS using a CPAP/BIPAP device should be advised to use the CPAP/BIPAP device at home. Otherwise, hospitalization is recommended.

Conflict of interest

We have no commercial associations, contractual relations, financial support or proprietary considerations that might pose a conflict of interest related or unrelated to the submitted manuscript and have had no involvements that might raise the question of bias in work reported or in the conclusions, implications, or opinions stated.

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