

Research Article

Perioperative Anaesthetic Considerations of the “Obese” for Bariatric and Metabolic Surgery

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Abstract

Adiposis has gained a surgical treatment option and this situation is discussed on the basis of the severity of disease or daily life disabilities. Body mass index (BMI as kg/m²) over 40 or over 35 with comorbidities are indications for bariatric surgery. Bariatric surgery improves quality and length of life for patients with morbid obesity. However, informed consent is very important because the surgery helps limiting underlying factors but does not eradicate the disease. The participation of the patient for perioperative process is mandatory. The medical history and clinical findings for preoperative anaesthetic evaluation are important because of many comorbidities as smoking, hypertension, thromboembolism, limited functional status, sleep apnea, hypoalbuminemia, coronary artery disease, stroke, bleeding disorder, dyspnea, chronic corticosteroid use, pulmonary hypertension, liver disease, congestive heart failure, cardiac arrhythmia, increased respiratory resistance, increased work of breathing, reduced lung volumes, increased resting heart rate, increased resting cardiac output, increased ventricular wall thickness.

Induction of anaesthesia requires three main objectives: airway management, ventilation and pharmacotherapy. Ventilating the patient with mask during induction may be difficult. Fast track intubation is preferable because there is a high risk for gastroesophageal reflux. Supine positioning leading the diaphragm shift towards lungs and makes situation worse for ventilation. The most profound reduction in lung parameters is the expiratory reserve volume. This will predispose small airway closure during normal breathing and lead to ventilation-perfusion mismatch and hypoxia. Pharmacokinetic is changed in obese population. Extracellular volume is increase, and protein binding is reduced. Uptake and elimination of inhalation anaesthetics are decreased due to impaired lung mechanics. Thrombosis is a very important perioperative risk factor associated with obesity because of increase in plasma levels of plasminogen activator inhibitor-1, increased procoagulants, endothelial dysfunction.

Key words: obesity, adolescents, metabolic syndrome, physical exercise.

Introduction

Obesity is an evergrowing public health problem and now flirting with adolescents. According to the report by the World Health Organization (WHO), at least 600 million adults worldwide were obese in 2014 [1]. In 1991 National Institutes of Health has given decision that bariatric surgery was only for adults. Patients who are affected with obesity and other metabolic derangements, such as hypertension and dyslipidemia, are at a twofold increased risk of developing cardiovascular disease and have a significantly increased risk of stroke, myocardial infarction, and death compared to unaffected individuals [2]. Jejunoileal and jejunoileal bypasses can be considered as the archetype for the malabsorptive bariatric operations. These operations are no longer performed, the proximal jejunum was connected to the distal ileum or colon, causing a short circuit for the small intestine and functioning as a iatrogenic “short-gut syndrome” [3]. Excess abdominal fat is an independent predictor of risk for type 2 diabetes mellitus (T2DM), dyslipidemia, hypertension, and cardiovascular disease in adults with a BMI between 25 and 35. Patients with BMI over 40 or over 35 in association with comorbidities and failed dietary management, medical therapies are eligible for bariatric surgery [4,5].

Preoperative Assessment

The patients undergoing bariatric and metabolic surgery should be assessed by using a checklist in order to enhance patient safety. Surgical and anesthesia teams having a discussion and briefing together will help patient management. This is a team work and includes dietitians, physicians, psychologists, nurses, anesthesiologist and surgeons [6,7].

The Airway

The incidence of difficult intubations in morbidly obese patients has been reported to be 12–20% [8]. The factors predisposing a patient to difficulty with airway management are increased neck soft tissue density, increased BMI, abnormal thyromental distance (Patil’s test), male gender, patients with short, thick necks, and neck range of motion [9,10].

During physical evaluation abnormal thyromental distance, Mallampati class IV, limited jaw mobility, and a history of a difficult direct laryngoscopy or fiberoptic intubation, oropharyngeal pathologies should be documented. An abnormal thyromental distance under 6 cm is found to be the strongest independent risk factor as it makes the risk of a difficult intubation four times than the normal [11].

Obstructive sleep apnea (OSA), gastroesophageal reflux disease, chronic obstructive pulmonary disease and a history of smoking are not predictors of a difficult intubation [12]. The STOP-BANG questionnaire (Snoring, Tiredness during daytime, observed apnea, high blood Pressure, Body mass index over 35, Age, Neck circumference, and Gender) is a validated follow-up tool for OSA [13]. OSA should be managed postoperatively avoiding respiratory arrest causing circulatory failure.

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Wilson classification including weight, head and neck movement, jaw movement, receding mandible and buck teeth to assess the prediction of direct laryngoscopy [14].

An increased Mallampati class, abnormal thyromental distance, restricted jaw mobility, and a history of difficult intubations were independent predictors of a difficult intubation. An increasing body mass index is not an independent predictor for a difficult intubation [15].

Systemic diseases

Bariatric surgery helps patients suffering from diabetes mellitus, cardiovascular, pulmonary, gastrointestinal, urogenital, orthopedic, and cancer diseases [3]. It is reported a 29-40% reduction in mortality within 10 years after surgery [16].

Pharmacokinetics

Benzodiazepines are lipophilic and their volume of distribution and elimination half time are increased. Midazolam is preferable as it has the shortest half time among benzodiazepines [17]. Its systemic clearance was 1.7 times higher 1 year later bariatric surgery [18].

Opioids are for induction and maintenance during general anesthesia. Patient-controlled analgesia requires opioids postoperatively. Dosing these drugs need attention as total body weight (TBW) for sufentanil, ideal body weight (IBW) for remifentanil, lean body mass (LBW) for fentanyl [19].

Propofol, thiopental, etomidate are intravenous anesthetics for induction of general anesthesia. TBW for propofol, LBW for thiopental and etomidate are preferred [20].

Pharmacokinetics of muscle relaxants are minimally affected by obesity. IBW is used for vecuronium, cisatracurium and rocuronium [21]. Rocuronium is the first choice because of its reversal by sugammadex. TBW for mivacurium is suitable [22].

Inhalational anesthetics sevoflurane or desflurane are preferable because of their relatively low lipid solubility [23].

Perioperative monitoring

5-lead electrocardiogram, pulse oxymeter, capnography, body temperature are essential parameters for monitoring. The operating table for obese patients suitable up to 350 kg will serve patient safety [3].

Perioperative complications

Positioning the "obese" is of high importance. Trendelenburg and lithotomy positioning under general anesthesia can lead to musculoskeletal problems even falling down the table. Compression cuffs for lower extremities are for reducing thromboembolic events [24]. There is not evidence based information for increase of postoperative pulmonary complications in obese patients than others, but strategies for reducing pulmonary complications are of important notice. The mortality rate for gastric bypass surgery is equal to the one-year-mortality for untreated morbid obesity.

As anxiety and depression effects pain perception, these factors are more frequent among obese patients than non-obese. Alexithymia is also frequent in obese patients. These factors lead to more anesthetic consumption postoperatively [25].

Gastrectomy leaks are a major problem. Gastric leaks occur mostly at the gastroesophageal junction. The current treatment algorithm includes drainage, antibiotics, nutritional and endoluminal control [26].

Little is known about the effect of immunosuppressive therapy on

perioperative bariatric surgery. According to the last literature it has a low risk [27].

Venous thromboembolism in the postoperative period of laparoscopic bariatric surgery is a fatal complication. There are approaches for avoiding this complication. These are preoperative weight loss, daily exercise, 5000 IU heparin administration before surgery and then every 8 hours after surgery subcutaneously, mechanical prophylaxis with ambulation within 3 hours of arriving to the bariatric unit and bilateral calf devices during the procedure and while in the hospital [28].

"Candy Cane Syndrome" is an underdiagnosed cause of abdominal pain and nausea after Roux-en-Y gastric bypass surgery. This is a blind afferent Roux limb at the gastro-jejunoanastomosis and needs surgical intervention [29].

Discussion

The use of positive end-expiratory pressure preoperatively influences time of extubation after cessation of anesthesia. Respiratory muscles are weak than normal population and bariatric surgery improves maximal inspiratory pressure by strengthening respiratory muscles [30]. This is quite significant after 9 months. Besides weakness of respiratory muscles, Obesity Hypoventilation Syndrome and OSA contribute to early postoperative pulmonary complications. ARISCAT (Assess Respiratory Risk in Surgical Patients in Catalonia) is a valuable tool to evaluate postoperative pulmonary complications [31].

Opioid sparing analgesia, NSAIDs and local anesthetics are effective avoiding high dose opioid consumption. It has been reported systemic lidocaine postoperatively helps recovery for the patients undergoing laparoscopic bariatric surgery. They had a lower opioid consumption. Multimodal pain control to reduce opioid consumption is associated with shorter length of stay at hospital [32].

Obesity surgery mortality risk score is a useful guide which includes arterial hypertension, age over 45 yrs, male gender, BMI over 50 kg/m² and pulmonary thromboembolism risk factors [33].

Bariatric surgery in the superobese population has positive outcomes of weight loss and medical comorbidities such as diabetes, hypertension, and OSA. Preoperative weight loss in bariatric surgery is an important determinant but weight loss below 10% and over 10% has no superior effect between each other. Staple line bleeding requiring blood transfusion or reoperation can be lowered by decreased pneumoperitoneum pressures intraoperatively [34].

De Baerdemaker and colleagues reported more stable hemodynamics after termination of anesthesia in obese patients after desflurane compared to sevoflurane. Combination of desflurane with remifentanil helps better recovery from anesthesia [35].

Conclusion

The obesity surgery mortality risk score can help both patients and surgical team as well as anaesthetists. Best practice requires trained personnel and well-designed equipment. Providing preoxygenation prevents desaturation periods. An optimal anesthetic protocol has not been defined yet. Electrical impedance tomography can help for optimizing ventilation strategies. Bariatric surgery in other terms weight loss surgery helps both for weight loss and reducing comorbidities, especially T2DM in long term [36]. Laparoscopic techniques provide enhanced recovery from surgery. Pregnancy after bariatric surgery appears to effectively reduce the risk of complications such as fetal macrosomia and hypertensive disorders of pregnancy; however, women who become pregnant after bariatric surgery are under risk of having preterm babies [37].

The role of multidisciplinary preoperative collaboration algorithms need to be developed. "Bariatric physicians", a speciality as e.g. pediatrics, geriatrics may be a need for medicine in the future. General practitioners are lacking knowledge for managing obese patients.

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