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Recent Updates in Anaesthetic Management of Bariatric Patients undergoing Bariatric Surgery

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Abstract

Obesity is a multi-system chronic pro-inflammatory disorder with increase morbidity and mortality. Adipocytes are far more than storage vessels for lipids, they secrete a large number of physiologically active substances called adipokines that lead to inflammation, vascular, cardiac remodeling, airway inflammation and altered microvascular flow patterns. to study the anaesthetic consideration in patients undergoing bariatric surgery in the pre-operative, intraoperative and postoperative phases of surgery. All patients presenting for bariatric surgery should be evaluated pre-operatively in an anesthesia pre-surgical screening clinic. This will allow an assessment of the patients' airway as well as vascular access issues that may present due to the presence of excess adipose tissue. In addition, co-morbidities such as hypertension and diabetes must be addressed prior to surgery. For instance, in the morbidly obese patient intravenous access may be difficult at best. These patients may benefit from a PIC line, or a central line, inserted on the day of surgery.

1. Introduction

Obesity is a multi-system chronic pro-inflammatory disorder with increase morbidity and mortality. Adipocytes are far more than storage vessels for lipids, they secrete a large number of physiologically active substances called adipokines that lead to inflammation, vascular, cardiac remodeling, airway inflammation and altered microvascular flow patterns [1].

BMI alone isn't a good predictor of the distribution of the excess body fat; central obesity with elevated visceral fat levels is associated with greater metabolic impact and complications than widespread subcutaneous fat.BMI may be misleading in patints with significant muscle bulk. it is also critical to understand that patients can have elevated body fat content despite anormal BMI, so called "normal body weight obesity " and this too can have an impact on organ function [2].

Implication for anaesthetic and perioperative care of severely obese patients are various, induction of anaesthesia is associated with potential risks as difficult airway, pulmonary aspiration of gastric contents, periods of hypoxia and hypercapnia, perioperatively may increase pulmonary vascular resistance and precipitate acute right sided heart failure especially in patients with pre-existing cardiac disease.

Bariatric surgery provides significant and sustained weight loss option for morbidly obese patients which improves the quality of life, surgeries are classified into many categories as example: gastric banding, gastric bypass, gastroplasty that can be done open or laparoscopic.

2. Pathophysiological changes in obese patients

Obesity impacts virtually all organ systems and is an independent risk factor for both morbidity and mortality. The fat cell, or adipocyte, is central to the pathophysiological changes that terminate in obesity- associated co morbidity. Adipocytes have two main roles. The first role is lipid handling, where adipose tissue can be viewed as an adaptive response aimed at controlling the potential toxicity of free fatty acid (FFA) levels. The second role is an endocrine and paracrine function central to the adverse impact of obesity. These cells actively produce and secrete a large number of important biologically active hormones referred to as adipokines, which include substances with metabolic and growth regulation roles as well as cytokines and collagens. Pro- inflammatory substances are secreted mainly by visceral fat cells, whereas adiponectin and leptin are the key substances produced by subcutaneous adipocyte [3].

2.1 Adipocytes and FFA

Elevated FFA levels and uptake play an integral part in adipocyte physiology. They trigger increased pro- inflammatory expression via pathways that involve Toll¬like receptor 4, nuclear factor kappa B (NF-kB), as well as several other mechanisms [4].

2.2 The metabolic syndrome (MetS)

The changes outlined above establish the necessary conditions for the development of the metabolic syndrome (MetS). Although definitions vary, for the purposes of research, MetS comprises obesity, hyper- or dyslipidemia, an insulin resistant state, and hypertension. The MetS is accompanied by an elevated level of pro-inflammatory and prothrombotic mediators [5].

2.3 Myocardial blood flow in obesity with the metabolic syndrome:

Metabolic syndrome is accompanied by significant alterations in myocardial blood flow, which, importantly, may predate the presence of detectable atheroma. Coronary vasodilatation in response to pharmacological or metabolic stimuli is reduced, and coronary autoregulation is inhibited [6].

2.4 Pulmonary physiological changes

Obesity related changes in respiratory function are, intuitively, related to the severity of the body mass increase and the location of the excess fat deposits. Clearly, upper body (waist and above) fat will have a greater impact on diaphragmatic excursion, chest wall mechanics, and work of breathing. In addition, there will be an important superimposed impact from body position and anesthesia [7].

2.5 Obstructive sleep apnea - definitions, detection

Obstructive sleep apnea refers to a period of partial or complete upper airway obstruction occurring during sleep. Not surprisingly, such episodes may result in hypoxemia and hypercapnia with associated hemodynamic changes, such as hypertension, that occur through the night and commonly lead to daytime somnolence. Long-term untreated OSA results in cardiovascular complications, such as hypertension and right-heart strain. Obstructive sleep apnea occurs in more than 70% of patients with a BMI > 35, and this is combined with OHS in about 10-20% of OSA patients.

2.6 Gastrointestinal system

Obesity further decreases lower oesophageal tone which is already decreased in pregnancy and increase the risk of aspiration of gastric contents and Mendelson's syndrome. Hiatus hernia is increased in obese patients. Obese population have a higher incidence of diabetes, which can cause delayed gastric emptying, increasing the risk for aspiration. Also, it is well known that obesity predisposes to difficult or failed intubation, both of which are associated with a higher incidence of aspiration [8].

3. Anatomical changes with obese patient

Deposit of excessive adipose tissue modifies the anatomy of morbid obese (MO) patients. When severe, these alterations present additional challenges in their anesthetic care. Airway management (face-mask ventilation and tracheal intubation)

Mechanical ventilation, peripheral and or central vascular access, regional anesthesia and other competencies related to anesthetic care are usually more difficult in these patients [9].

Bariatric surgery (also referred to as metabolic surgery) is also being investigated as a possible primary therapy for type 2 diabetes. Results from randomised controlled trials and systematic reviews with meta- analyses have shown superior glycaemic control with bariatric surgery compared with conventional medical therapy alone in people with obesity and type 2 diabetes [10].

Bariatric operations are preventive as well as therapeutic. Weight-loss achieved post- operatively may forestall or stop development of a significant number of obesity co-morbidities [11].

Not surprisingly, the number of bariatric surgeries is steadily increasing, with a doubling in the number of adult bariatric surgeries performed worldwide over the past decade [12].

3.1 Types of bariatric procedures

The best choice for any bariatric surgery depends on the goals of therapy for each individual patient (eg, weight loss and/or glycemic control), expertise of the surgeon and institution, patient preferences, and personalized risk stratification. Ingeneral, laparoscopic bariatric procedures are preferred over open procedures due to lower early postoperative morbidity and mortality [13].

The most common weight-loss procedures in the United States include adjustable gastric banding (AGB), sleeve gastrectomy (SG), and Roux-en-Y gastric bypass (RYGB). Another procedure that is less commonly performed includes biliopancreatic diversion with duodenal switch (BPD-DS). This particular surgery has fallen out of favor over the years secondary to high complication rates [14].

3.2 Contraindications of bariatric surgery

Mean contraindications are regarding psychiatric (not stabilised) disorders, behavioural eating disorders (such as bulimia and binge-eating disorder), addictions (alcoholism, toxicomania) and uncontrolled progressive severe chronic disease (cancer, cirrhosis, infl ammatory bowel disease, etc.). Here we report the schematic contraindications to bariatric surgery of the Interdisciplinary European Guidelines on Metabolic and Bariatric Surgery [15].

4. Perioperative management of bariatric patients undergoing bariatric surgery

4.1 Preoperative management

Patient assessment prior to bariatric surgery is important to inform the planning of the anesthetic technique, anticipate potential problems and importantly to build rapport and educate patients about the surgical process. Many morbidly obese patients are aware that they are at higher risk for anesthesia and are consequently often quite anxious [16].

It is essential to provide a clinical setting that makes obese patients feel comfortable with respect to physical conditions. Outpatient setting or room should be designed according to overweight/obese patients. Primary physicians or surgeons of the patients should not believe mistakenly that they have adequate knowledge about their patients medical situation. Comorbidities or other accompanying diseases may not frequently be well-documented. Preoperative assessment by anesthesiologist should include the presence of hyperglycemia or type 2 diabetes mellitus, hyperlipidemia, hypertension, coronary artery

disease, respiratory problems, liver disease, and obstructive sleep apnea (OSA). As per indicated surgical procedure, impacts of osteoarthritis should be considered regarding positioning of patient especially during elective surgery [17].

On the basis of a thoroughly performed medical history-taking and physical examination, additional testing that are based on abnormal findings should be performed, Both medical history-taking and physical examination should be carried out according to a standardized scheme. A special focus should be laid on the presence of OSA, because this condition can be uncovered by a simple and easy-to-answer questionnaire and is of high relevance for the perioperative period in the obese population. Given the fact that 40–90% of the obese are affected by OSA, a protocol for the evaluation to a patient's individual risk should be integrated in the medical history taking [18].

Following moderate or major surgery, it may be necessary to titrate cardiovascular medications, particularly beta blockers, to effect. Patients with atrial fibrillation may be anticoagulated with warfarin and a decision must be made whether their thromboembolic risk warrants bridging therapy with lowmolecular weight heparin or if anticoagulation can simply be discontinued perioperatively for minor or moderate surgery Preoperative omission of antiplatelet therapy may be mandatory, for example, prior to intracranial and spinal surgeries. Particularly in the presence of recently inserted coronary stents, this must be discussed with a cardiologist [19].

4.2 Nutritional assessment

A preoperative nutritional assessment with a registered dietitian is essential when preparing for surgery. The preoperative nutritional assessment is designed to help the patient recognize the need for positive lifestyle changes and develop a plan to implement them. This will likely result in improvement of nutritional status, better management of nutrition-related comorbidities and development of habits that will positively influence weight loss outcomes and maintenance [20].

4.3 Psychological assessment:

The fight against obesity has many fronts. Simply reducing the capacity or absorption of the gastrointestinal tract will not have long lasting effects on weight if the psychosocial aspects of the disease are not addressed. An essential part of the preoperative evaluation is a psychological clearance [21].

4.4 Extubation and recovery

Prior to tracheal extubation, patients should have full return of neuromuscular function, and they should be cooperative and alert with adequate spontaneous tidal volumes, especially if elective NIV is not plannee following tracheal extubation. Careful attention must be paid to ensure adequate doses of reversal agent are used as postoperative residual curarization has the potential to precipitate acatastrophic decline in respiratory status and acid-base in the severely obese, even in the absence of OHS or overt OSA. Gaszynski et al., 2012 studied reversal of rocuronium induced neuromuscular block with sugammadex 2 mg_kg-l corrected body weight or neostigmine 50 lg corrected body weight in 70 morbidly obese patients [22].

Delayed recovery from anesthesia may occur due to sequestration of lipid-soluble anesthetic drugs in MO patients. Special consideration should be taken to ensure the patient has fully recovered protective airway reflexes, adequate respirations, and complete muscle strength before extubation. In addition, placing the patient in the reverse Trendelenburg position improves alveolar recruitment and distention, decreases atelectasis, and may help to improve oxygenation throughout emergence.The surgical approach for bariatric surgery also contributes to postoperative pulmonary complications. Open abdominal approaches reduce functional residual capacity and forced expiratory volume in 1 second more than laparoscopic approaches. In addition, they are also associated with more postoperative pain than laparoscopic approaches, resulting in tachypnea, shallow breathing, and impairment of respiratory mechanics. Regardless of the surgical approach, inadequate postoperative pain management can lead to hypoxemia, hypercarbia, and atelectasis.

4.5 Postoperative management

4.5.1 Immediate post-anaesthesia care

Full monitoring should be maintained in the postanaesthesia care unit (PACU). The patient should be managed in the sitting position or with a 45° head-up tilt. Oxygen therapy should be applied to maintain pre-operative levels of arterial oxygen saturation and should be continued until the patient is mobile postoperatively. If the patient was using CPAP therapy at home, it should be reinstated on return to the ward or even in the PACU if oxygen saturation levels cannot be maintained by the use of inhaled oxygen alone. If supplemental oxygen is necessary, this can either be given via the patient's CPAP machine or via nasal specula under the CPAP mask.

4.5.2 Postoperative Pain Management

Recommendation includes the use of intravenous Acetaminophen preoperatively and for first 24 hours, local analgesia to be administered to the port sites at time of surgery, and Ketoralac to be administered for first 24 hours at surgeon discretion, and narcotics via patient-controlled analgesia (PCA) for first 24 hours with prompt transition to oral narcotics. Multimodal pain therapy beginning prior to surgery has been shown to be both clinically and cost effective in the

postoperative care of bariatric surgery patients. Multimodal therapy includes the use of: Acetaminophen, Ketorolac and narcotics [23].

RCTs and meta-analyses have demonstrated the safety of local anaesthetic aerosolisation techniques in laparoscopic surgery. It may be combined with pre-incision infiltration. Efficacy of its use has also been demonstrated in bariatric surgery and ropivacaine or levobupivacaine seem to be more effective than short-acting agents, like lidocaine [24].

4.6 Infection risk

Obesity is an independent risk factor for postoperative infectious complications. Patients with obesity are more likely to develop bloodstream infection, skin and softtissue infections, wound infections, wound dehiscence, urinary infections, and possibly pulmonary infections [25].

4.7 Postoperative nausea and vomiting prophylaxis

Bariatric patients are frequently<50 years of age, female and nonsmokers undergoing laparoscopic procedures of more than one hour in duration, and receive postoperative opioid analgesia, all of which are risk factors for PONV Additionally, a history of PONV or motion sickness, as well as the use of volatile anaesthetic increases the risk of PONV [26].

4.8 Postoperative GERD

Empiric treatment with a proton pump inhibitor in patients without GERD or GERD symptoms following sleeve gastrectomy is not recommended. GERD should be treated as in patients who have not had a sleeve gastrectomy and in accordance with clinical and society guidelines. [27]

5. Summary

All patients presenting for bariatric surgery should be evaluated pre-operatively in an anesthesia pre-surgical screening clinic. This will allow an assessment of the patients' airway as well as vascular access issues that may present due to the presence of excess adipose tissue. In addition, co-morbidities such as hypertension and diabetes must be addressed prior to surgery. For instance, in the morbidly obese patient intravenous access may be difficult at best. These patients may benefit from a PIC line, or a central line, inserted on the day of surgery.

In terms of comorbidities, cardiac disease is frequently found in the obese patient and includes hypertension as well as coronary artery disease. Hypertension should be adequately controlled and critical coronary lesions must be addressed before the patient presents on the day of surgery. The pulmonary system will be altered due to the decrease in chest wall compliance resulting from excess adipose tissue on the chest wall and upward displacement of the diaphragm in the supine position. This results in decreased lung volumes and a faster desaturation during periods of apnea.

Positioning on the operating room table is of significant importance to avoid nerve injury during these lengthy procedures. The patient is positioned on the table and the table is then manipulated as a test to see if any changes in position need to be made before the induction of anesthesia. The patient is able to express any discomfort due to position before surgery.

Postoperatively, supplemental oxygen should be administered. Elevation of the torso to 45 degrees will allow for greater lung volumes than in the recumbent position. If a patient is CPAP dependent it should be available in the PACU. The use of narcotics should be minimized, and intravenous acetaminophen or other non-steroidal drugs utilized, in their place, to avoid narcotic induced post-operative respiratory depression.

As one can see, from this brief overview, bariatric surgery presents the anesthesiologist with challenges not encountered on other types of surgery

References

[1] A Cullen and A Ferguson Perioperative management of the severely obese patients, a selective pathophysiological review, Canadian Journal of Anesthesia; Vol. 59(10) , PP. 974-996, 2012

[2] Kosmala, D Jedrzejuk, R Derzhko,. left ventricular function impairmentin patients with normal weight obesity; contribution of abnormal fat deposition, profibrotic state, reduced insulin sensitivityand proinflammatory activation. Circ Cardiovascular Imaging; Vol. 5, PP. 349-356, 2012.

[3] Wronska and Z Kmiec, structural and biochemical characteristics of various white adipose tissue depots. Acta Physiol (Oxf); Vol. 205, PP. 194-208, 2012.

[4] S Sun, Y Ji, S Kersten, Mechanisms of inflammatory responses in obese adipose tissue. Annu Rev Nutr; Vol. 32, PP. 261-86 , 2012.

[5] E Oda. Metobolic syndrome: its history, mechanisms, and limitations. Acta Diabetol; Vol. 49, PP. 89-95, 2012.

[6] ZC Berwick, GM Dick and JD Tune, Heart of the matter: coronary dysfunction in metabolic syndrome. J Mol Cell Cardiol; Vol. 52, PP. 848-56, 2012.

[7] SW Littleton, Impact of obesity on respiratory function. Respirology; Vol. 17, PP. 43-9, 2012.

[8] RB Roberts and MA Shirley, Reducing the risk of acid aspiration during caesarean section, Anaesthe Analgesia; Vol. 53, PP. 859-868. , 1974.

[9] A Eichenberger, S Proietti, Morbid obesity and postoperative pulmonary atelectasis: an underestimated problem. Anesth Analg; Vol. 95, PP.1788-1792, 1974.

[10] PR Schauer, DL Bhatt, JP Kirwan, Bariatric surgery versus intensive medical therapy for diabetes - 5-year outcomes. N Engl J Med.; Vol. 376, PP. 641-51, 2107.

[11] L. Sjöström Review of the key results from the Swedish Obese Subjects (SOS) trial – a prospective controlled intervention study of bariatric surgery. J Intern Med.; Vol. 273(3) , PP. 219–34, 2013.

[12] H Buchwald, DM Oien, Metabolic/Bariatric Surgery Worldwide Obesity Surgery.; Vol. 23(4) , PP. 427–36, 2011.

[13] S Khan, K Rock, A Baskara, Trends in bariatric surgery from 2008 to 2012. Am J Surg; Vol. 211(6) , PP. 1041–6, 2016.

[14] ES Bour, Evidence supporting the need for bariatric surgery to address the obesity epidemic in the United States. Curr Sports Med Rep, Vol. 14(2) , PP. 100–3, 2015.

[15] M Fried, Interdisciplinary European guidelines on metabolic and bariatric surgery. Obes Surg., Vol. 24(1) , PP. 42–55, 2014.

[16] AM Wren, MD Feher, Medical management of the patient considering bariatric surgery. Curr Anaesth Crit Care, Vol. 21(1) , PP. 3–8, 2010.

[17] ML Collazo-Clavell, Bariatric surgery: important considerations for the primary care provider. Compr Ther.; Vol. 34(3–4) , PP. 159–165, 2008.

[18] VE Ortiz, J. Kwo Obesity: physiologic changes and implications for preoperative management. BMC Anesthesiol; Vol. 15, PP. 97, 2015.

[19] JD Douketis, AC Spyropoulos, S Kaatz, RC Becker, JA Caprini, AS Dunn, et al. Perioperative bridging anticoagulation in patients with atrial fibrillation. N Engl J Med.; Vol. 373, PP. 823–33, 2016.

[20] CK Biesemeier, J Garland eds. ADA Pocket Guide to Bariatric Surgery. Chicago, IL: American Dietetic Association , 2009.

[21] LJ Heinberg, K Ashton, A Windover, Moving beyond dichotomous psychological evaluation: the Cleveland Clinic Behavioral Rating System for weight loss surgery. Surg Obes Relat Dis.; Vol. 6, PP. 185-90, 2010.

[22] T Gaszynski, T Szewczyk and W Gaszynski. Randomized comparison of suggamadex and neostigmine for reversal of rocuronium induced muscle relaxation in morbidly obese undergoing general anaesthesia. Br J Anaesth; Vol. 108, PP. 236-9, 2012.

[23] K Song, MJ Melroy, OC Whipple. Optimizing multimodal analgesia with intravenous acetaminophen and opioids in postoperative bariatric patients. Pharmacotherapy; 34 Suppl Vol. 1, PP. 14S- 21S , 2014.

[24] B Hilvering, WA Draaisma, JD van der Bilt, Randomized clinical trial of combined preincisional infiltration and intraperitoneal instillation of levobupivacaine for postoperative pain after laparoscopic cholecystectomy. Br J Surg Vol. 98, PP. 784–789, 2011.

[25] R Huttunen and J Syrjanen Obesity and the risk and outcome of infection. Int J Obes (Lond). , 2012.

[26] CC Apfel, FM Heidrich, S Jukar-Rao, Evidencebased analysis of risk factors for postoperative nausea and vomiting. Br J Anaesth Vol. 109, PP. 742–753, 2012.

[27] PO Katz, LB Gerson, MF Vela, Guidelines for the diagnosis and management of gastroesophageal reflux disease. Am J Gastroenterol.; Vol. 108(3), PP. 308-28; quiz 29, 2012.