Canadian Adult Obesity Clinical Practice GUIDELINES

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L'ASSOCIATION CANADIENNE des MEDECINS et CHIRURGIENS BARIATRIQUE
The CANADIAN ASSOCIATION of BARIATRIC PHYSICIANS and SURGEONS

Bariatric Surgery: Selection & Preoperative Workup

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Version 1, August 4, 2020. The Canadian Adult Obesity Clinical Practice Guidelines are a living document, with only the latest chapters posted at obesitycanada.ca/guidelines.

KEY MESSAGES FOR HEALTHCARE PROVIDERS

- Criteria for selection of appropriate candidates for bariatric surgery have been established to minimize surgical complications and to maximize the benefit of these important and limited procedures.
- The preoperative workup should evaluate a patient's medical, nutritional, mental and functional health status.
- Special attention should be given to the care of patients living with type 2 diabetes (T2DM) who are considering bariatric surgery to minimize complications from uncontrolled diabetes in the perioperative period.
- Because of the risks of postoperative complications associated with tobacco use, cessation prior to bariatric surgery is mandatory and should be maintained lifelong.
- In patients living with severe obesity, bariatric surgery, in combination with behavioral interventions, is a more effective option for long-term weight loss and control of chronic conditions, such as T2DM, hypertension, sleep apnea and dyslipidemia, as well as other conditions associated with increased adiposity.

RECOMMENDATIONS

- We suggest a comprehensive medical and nutritional evaluation be completed and nutrient deficiencies corrected in candidates for bariatric surgery (Level 4, Grade D).[1,2]
- Preoperative smoking cessation can minimize postoperative complications (Level 2a, Grade B).[3]
- We suggest screening for and treatment of obstructive sleep apnea in people seeking bariatric surgery (Level 4, Grade D).[4,5]

KEY MESSAGES FOR PEOPLE LIVING WITH OBESITY

- Bariatric surgery is the beginning of a life-long journey. You should educate yourself about the necessary changes required to optimize your long-term outcomes for a healthier life.
- Before surgery you will be asked to perform several investigations such as blood work, cardiac or pulmonary testing, to ensure that you are ready and safe for surgery.
- If you are at high risk for obstructive sleep apnea, you may be asked to undergo a sleep study to determine if you have significant sleep apnea.
- A current or recent history of smoking or nicotine consumption puts you at risk of complications after bariatric surgery. Smoking is cessation is required before surgery, and must be maintained for life.
- You may be given a low-calorie diet two to three weeks before surgery in order to shrink your liver size and make your surgery easier.
- If you are living with diabetes, you will have to follow your blood sugars very closely and obtain instructions on how to adjust your diabetes medications while on the low-calorie diet prior to bariatric surgery.
- Because changes in the absorption of some medications may occur with certain bariatric surgical procedures, you may be asked to change either the type or preparation of the medication you are currently taking.

Selection of appropriate patients for bariatric surgery

Extensive preparation of patients prior to bariatric surgery is required. Potential candidates for bariatric surgery undergo multidisciplinary evaluation and optimization of their medical, mental, nutritional and functional health to assess their eligibility and safety to proceed with surgery. Further medical evaluations may include cardiac, respiratory, metabolic, gastrointestinal and sleep apnea testing. Once adequate evaluation and preparation have been undertaken, the patient may proceed for bariatric surgery if stable. It is recommended that patients engage in behavioral interventions prior to bariatric surgery and maintain those behavioral changes after bariatric surgery, as well.

Bariatric surgery is indicated in patients greater than 18 years of age with a body mass index (BMI) of 35 kg/m², who have at least one major obesity-related complication including type 2 diabetes (T2DM), hypertension, hyperlipidemia, pseudotumor cerebri, obesity hypoventilation syndrome or Pickwickian syndrome, debilitating arthritis, nonalcoholic fatty liver disease or nonalcoholic steatohepatitis, coronary artery disease, severe reflux or obstructive sleep apnea.[1] Bariatric surgery is also indicated for patients with a BMI of 40 kg/m² independent of the presence of obesity related complications.[6] Bariatric surgery may also provide therapeutic benefit in patients with a BMI between 30 and 34.9 kg/m² who have been refractory to nonsurgical attempts at weight loss with obesity-related complications, especially T2DMs. The indications for surgery in these patients may be predicated heavily on the obesity-related complications that are present and weighing the durable response to bariatric surgery compared with existing medical interventions.[7,8]

Adolescent candidates who have a BMI greater than or equal to 35 kg/m² may be considered for a bariatric procedure if they possess additional significant complications, including T2DM, significant obstructive sleep apnea with an apnea-hypopnea index measured at 15 or higher, pseudotumor cerebri or severe nonalcoholic steatohepatitis. In addition, consideration may be given to those adolescent candidates with a BMI of greater than or equal to 40 kg/m^2 with other complications, such as hypertension, insulin resistance or glucose intolerance, significant impairment with their quality of life or activities of daily living, hyperlipidemia, or obstructive sleep apnea.[114]

General considerations for bariatric surgery candidates

Potential surgical candidates should have a history of identifiable attempts at the medical management of obesity. All patients must be committed to engage in the educational process involved in preparing for bariatric surgery as well as adhering to the necessary long-term follow-up, both from a nutritional and medical perspective. Appropriate surveillance and treatment of potential long-term nutritional deficiencies as well as assessment and intervention for their obesity-related complications and mental health is crucial for long-term success.

Patients with unstable psychiatric illness, malignancy or other diseases associated with decreased life expectancy, substance abuse or an inability to adhere to long-term follow-up may be considered inappropriate candidates for surgery due to a high risk of short- and long-term complications.

Advanced patient age is not an absolute contraindication to bariatric surgery. The outcomes and complication rates for patients greater than 60 years of age appear to be comparable to those of a younger population, regardless of the surgical procedure performed.[9]

Nonalcoholic steatohepatitis (NASH) is common in patients living with obesity and can lead to liver cirrhosis. The risk of bariatric surgery in patients carefully selected with Child-Pugh Class A liver cirrhosis is not prohibitive, but caution and additional surveillance should be undertaken as their overall risk for perioperative complications and mortality is increased.[10,11] In addition, nonalcoholic steatohepatitis is the third most common indication for transplantation of the liver, and, with growing incidence, NASH is becoming an increasingly frequent cause for liver transplantation.[12–14]

The morbidity and mortality rate of bariatric surgery before or after liver transplantation is increased but remains acceptable in tertiary care centers.[15]

Predictors of successful post-operative weight loss

Behavioural changes

Exercise in conjunction with obesity management programs has been demonstrated to improve weight loss and body composition. Thirty minutes per day (150 minutes per week) of moderate-intensity exercise after bariatric surgery is associated with a 3.6 kg additional weight loss compared with individuals who do not exercise after bariatric surgery.[16]

In preparation for bariatric surgery, candidates may benefit from implementing health behavior change interventions. Interventions include extensive education on nutrition and the need for exercise, and behavioral strategies for successful weight loss and weight maintenance, exploring topics such as self-monitoring, mindless eating and goal setting. However, bariatric surgical patients subjected to a behavioral intervention program for six months prior to bariatric surgery experienced no significant difference in the degree of their weight loss at 24 months after surgery compared with control subjects.[17]

Patients' concurrent eating patterns may play a significant role in the effect of postoperative weight loss. In addition, past traumas may also impact upon weight-loss outcomes post-bariatric surgery. The presence of a history of binge eating disorder or a previous history of sexual abuse did not seem to predict difference in weight loss outcomes at two years post-bariatric surgery, but this area remains controversial and requires further study.[18]

Pre-operative weight loss

Weight reduction is associated with improvement of cardiac risk factors and the associated complications of obesity. As little as 5%–10% weight loss can improve cardiovascular risk factors and reduce complications, such as hypertension, hyperlipidemia, T2DM, visceral fat and hepatic steatosis, as well as liver volume. High-protein diets produce rapid weight loss, provide adequate satiety, experience less lean body mass loss and have a decreased reduction in the resting energy expenditure.[19] There does not appear to be any compromise in immune function or any effect on wound healing with the use of high-protein diets.

Failure to achieve adequate postoperative weight loss outcomes is often attributed to preoperative psychosocial characteristics and eating behaviors, as well as poor adherence to the recommended postoperative nutrition plan after bariatric surgery.[20] Past weight management attempts preoperatively may reflect a patient's ability to follow a strict medical nutrition plan and exercise program postoperatively.[20]

Preoperative weight stability is desired for patients prior to bariatric surgery. Preoperative weight loss may decrease the difficulty of performing bariatric surgery, minimize blood loss, improve short-term weight loss and short-term complications, as well as decrease operative time.[21–23]

Patients who achieved ≥ 5% excess body weight loss preoperatively experienced more substantial weight loss at one year compared with those with less preoperative weight loss.[24] However, longer-term studies reviewing preoperative weight loss outcomes did not confer any advantage at four years with respect to weight loss outcomes.[25]

Overall, there is no compelling evidence mandating weight loss prior to bariatric surgery for the long-term efficacy of weight management, but rather only for the technical simplicity of the surgery.[20]

Pre-surgical medical nutrition therapy

Many preoperative protocols include the use of a liquid-based, low-calorie diet for two to three weeks prior to surgery.[26] Low-calorie diets in Canada provide around 900 calories per day, consisting of low carbohydrates, high protein and low-fat intake.

Bariatric surgical patients are requested to consume very low-calorie meal supplements in the form of commercially available protein shakes totaling 650–900 kcal/day for two to three weeks prior to surgery. A low-calorie diet which is low in carbohydrates may cause reduced liver volume by up to 19% and a 17% reduction in visceral adipose tissue.[26,27]

A systematic review found that very low-calorie diets (VLCDs) are effective at reducing body weight and hepatic volume prior to surgery. These diets do not reduce intraoperative or post-surgical risks.[26] They do result in a surgeon's perception that the difficulty of performing the operation is decreased.[21]

The effect of preoperative weight management also provides additional motivation to the patient in preparation for bariatric surgery. However, adherence and compliance with preoperative meal supplements may be poor and occasionally not well tolerated. In addition, meal supplements may be expensive. Preoperative weight loss with a two-week VLCD may approach approximately 6 kg.[28]

Preoperative patients taking a VLCD using Optifast® 800 kcal per day for two weeks prior to surgery were compared with patients ingesting the same caloric intake from a normal diet. There was a non-significant difference in the operating time, but there was

a higher surgeon–perceived scale of difficulty in control patients compared with patients who received a VLCD prior to surgery. The 30-day complication rate was higher in control patients, including wound GI and deep hemorrhage, infection, dehiscence and anastomotic leak.[21] In another study, preoperative weight loss of ≥8% excess weight in patients following a VLCD for four weeks prior to surgery was associated with decreased hospital length of stay and greater three-month and one-year postoperative weight loss compared with those who did not follow a VLCD.[22,29] Neither the major complication rate nor conversion rates were affected by the degree of preoperative weight loss.[22]

Risk Assessment Prior to Bariatric Surgery

Nutritional evaluation

Limited high-quality evidence has reviewed preoperative malnutrition status in patients seeking bariatric surgery. Nonetheless, observational studies have indicated that patients living with obesity have a higher risk for inadequate nutritional status[2,30–32] and malnutrition.[30,33,34] Preoperative evaluation and collaborative support from a registered dietitian is recommended for all patients considering bariatric surgery.[1,2]

A large, multicenter retrospective observational study (n=106,577) found that ~6% of patients undergoing bariatric surgery were malnourished and had increased risk of death or serious morbidity and 30-day readmission rates.[33] This study also found that >10% weight loss prior to surgery was associated with nine-times higher rates of DSM (Diagnostic and Statistical Manual of Mental Disorders) in patients with mild malnutrition, and 10-times higher DSM in those with severe malnutrition.[33] Similarly, a retrospective cohort study concluded that 32% of the patient cohort (n=533) had malnutrition prior to surgery.[34] Higher BMI was associated with increased risk for malnutrition, and post-operative nausea and vomiting were associated with preoperative malnutrition.[34]

Prevalence of preoperative micronutrient deficiencies is also higher in patients with obesity.[35] Preoperative lab work should include complete blood count, creatinine, iron panel, vitamin D, calcium, albumin and vitamin B12. Fasting plasma glucose, hemoglobin A1C, lipid panel and liver enzymes can also be measure at the same time, as part of the evaluation of obesity-related metabolic complications. Vitamin A, parathormone, phosphate, zinc, selenium and copper levels can be assessed more selectively, due to cost considerations. Preoperative optimization of micronutrient levels prior to surgery, specifically levels of vitamin D, vitamin B12 and iron, is recommended.[2] Preoperative multivitamin complex with vitamin B1 is usually started at least one month prior to surgery. Of note, patients taking proton pump inhibitors and/or metformin have a higher prevalence of vitamin B12 deficiency.[2]

Smoking and nicotine use

Smoking and nicotine cessation should be recommended for all patients undergoing bariatric surgery. Surgical centers recommend that smoking cessation should be achieved for at least six weeks up to six months prior to bariatric surgery to ensure adequate extinction of consumption.[36]

Nicotine contributes to ulcer development by potentiating acid and pepsin secretion, increases bile salt reflux, increases H. pylori infection risk and diminishes prostaglandin synthesis, mucosal blood flow and gastric mucus.[113]

Cigarette smoking may be associated with increased risk of marginal ulceration and may increase the risk of stricture formation. Complications related to smoking exposure on average may occur post operatively around 14 months.[37]

Smoking post-bariatric surgery may also be associated with pneumonia and postoperative complications with subsequent surgeries involving body contour surgery and mastopexy.[3,38–42]

Preoperative investigations

The preoperative evaluation of a bariatric surgical candidate is similar to those patients considered for similar-risk surgery, with some caveats. Bariatric surgical candidates may have additional factors which may make their clinical evaluation more challenging. Many patients referred for bariatric surgery may have a low or exceptionally low functional capacity.

Cardiac evaluation: Exercise tolerance is a predictor for surgical outcomes; symptom-limited stairclimbing, for example, is predictive of postoperative cardiopulmonary complications in patients undergoing high-risk surgery.[43] In addition, obesity is an independent risk factor for cardiovascular disease. Many patients with obesity may also convey symptoms of shortness of breath or chest pain, and the etiology of these symptoms may be varied. Furthermore, the physical examination in patients living with obesity may be challenging in that physical findings such as distant heart sounds or the evaluation of the jugular venous pressure may be difficult to obtain.

Patients undergoing bariatric surgery may have abnormalities in their electrocardiogram (ECG). An abnormal ECG in patients undergoing bariatric surgery may be independently associated with a higher likelihood of a complicated postoperative course, including the need for postoperative intensive care (ICU) admissions.[44] Obesity may also be associated with changes in cardiac morphology, including left ventricular hypertrophy, diastolic dysfunction or left ventricular dysfunction. Bariatric surgery is associated with a decrease in left ventricular mass index, left ventricular end-diastolic volume, improvement in diastolic dysfunction and systolic function, and left atrial diameter.[45]

Cardiac echo is not typically performed during preoperative evaluations, but may be required to detect suspected left or right ventricular dysfunction, valvular heart disease or pulmonary hypertension. The visualization of the echocardiographic images is often suboptimal, and echocardiographic contrast agents im-

prove the ability to identify endocardial borders and to assess ventricular wall motion abnormalities. A radionuclide angiography (RNA) multigated acquisition (MUGA) scan may also be helpful in the assessment of ejection fraction. Cardiac nuclear stress testing may be required to investigate chest pain. In patients with BMI > 30 kg/m^2, an abnormal nuclear stress test was associated with a higher annual cardiac event rate, cardiac death or death from any cause.[46] Computed tomographic coronary angiography may be difficult with increased body habitus due to depth-dependent spatial resolution. In addition, computerized tomography scanner tables may be limited by weight restriction. The gold standard for cardiac evaluation remains coronary angiography, which was not associated with an increase in minor or major complication rates in patients living with obesity.[47]

Pulmonary evaluation: The respiratory system is also significantly affected in patients with an elevated BMI. Impairment in pulmonary function due to restriction in lung volumes and abnormalities in respiratory mechanics resulting in increased work of breathing may detrimentally affect the respiratory status of bariatric surgical candidates.[48,49]

Sleep apnea: It is not uncommon for people living with obesity to experience sleep-related disorders, which may result in significant respiratory, cardiovascular and neuropsychiatric conditions.[72] Obstructive sleep apnea, one type of a sleep-related disorder, is either the complete cessation of airflow (apnea) or the significant reduction of airflow (hypopnea) measured during sleep. The presence of obstructive sleep apnea has been associated with premature death,[73] motor vehicle accidents,[74] hypertension,[75] coronary artery disease and cerebrovascular accidents,[76] nocturnal cardiac arrhythmias,[77] and T2DM.[78] In addition, obstructive sleep apnea has been associated with a significant increase in the incidence of sudden death from all cardiac causes.[79] Obstructive sleep apnea has been demonstrated to affect the white matter within the limbic system, pons, frontal, temporal and parietal cortices, and projections connecting the cerebellum, which are key areas for brain function and memory.[80]

The incidence of obstructive sleep apnea in middle-aged adults in the Wisconsin Sleep Cohort Study was approximately 24% in males and 9% in females.[81] In patients undergoing bariatric surgery, the prevalence of obstructive sleep apnea can be ≥ 90%, with clinically significant sleep apnea underdiagnosed in as many as 50% of these patients.[4,5] The prevalence of obstructive sleep apnea is much higher in males compared with female bariatric surgical candidates.[82] The recognition of the diagnosis of obstructive sleep apnea is even more challenging as there may be no correlation between the severity of obstructive sleep apnea and BMI.[83]

Bariatric surgery results in improvement or resolution of a patient's obstructive sleep apnea.[84] Obstructive sleep apnea in the bariatric population is believed to be caused by excess fat deposition in or around the neck, causing the patient's upper airway passages to collapse.[85] Patients undergoing bariatric surgery who have obstructive sleep apnea may have a higher complication rate, which may include a prolonged hospital stay, the occurrence of thromboembolic phenomena, the need for reintervention, and an increased 30-day mortality rate.[71] In addition, the presence of obstructive sleep apnea may be associated with more challenging intubations and increased ICU admissions.[86,87]

The gold standard in the diagnosis of obstructive sleep apnea is a level 1 polysomnogram (PSG).[88] Resources for overnight in-laboratory PSG testing can be limited and expensive.[89] As a result, alternative methods for identifying patients at risk for obstructive sleep apnea have been established. Utilizing screening questionnaires, including the STOP-Bang Questionnaire, Berlin Questionnaire and Epworth Sleepiness Scale, has become routine for patients undergoing surgery. To identify bariatric surgical patients with clinically significant obstructive sleep apnea, relying on subjective screening questionnaires may fail to identify at risk patients.[5,90] While some advocate that all bariatric surgical patients should be subjected to formal PSG, such resources are limited and costly.[83]

The STOP-Bang or the Berlin Questionnaire may not be effective tools for detecting moderate- or high-risk patients for obstructive sleep apnea in patients undergoing bariatric surgery, and so more effective tools should be considered or developed.[5] There may also be no significant correlation between the Epworth sleepiness score and severity of obstructive sleep apnea.[91] There should be a high clinical suspicion for the presence of obstructive sleep apnea in bariatric patients undergoing surgery, with a low threshold for subjecting the patient to a formal PSG. In addition, the use of continuous positive airway pressure immediately postoperatively after gastric bypass is safe and, should be administered if deemed clinically indicated.[92]

Bariatric surgery is beneficial in improving obstructive sleep apnea.[93] However, despite significant weight loss postoperatively, bariatric surgical patients may have persistence of moderate to severe obstructive sleep apnea at one year postoperatively.[94]

The long-term relationship between weight loss and sleep apnea is complex. There should be hypervigilance for recurrence of the presence of obstructive sleep apnea in patients previously diagnosed with obstructive sleep apnea, as reappearance can occur in the absence of weight regain.[95,96]

Endoscopy: There exists controversy in the utility of preoperative endoscopy in patients undergoing bariatric surgery. Most patients who undego endoscopy have normal or non-clinically significant findings. The consideration for performing endoscopy should be individualized based on symptoms, risk factors and type of procedure being considered for each patient.[50] Patients considering sleeve gastrectomy who have dyspepsia, reflux, dysphagia or symptoms suggestive of foregut pathology, as well as those on chronic anti-acid therapy, should undergo preoperative endoscopy to rule out the presence of hiatal hernia, esophagitis or Barrett's esophagus, or other diseases such as peptic ulcer disease and tumors.[51–55] Screening for H. pylori can be performed at the time of endoscopy. The incidence of H. pylori in patients with obesity planning to undergo bariatric surgery is variable, ranging between 15 and 85%.[55,61] H. pylori may be implicated in the

development of gastritis, peptic ulcer and gastric carcinoma.[62,63] Screening for H. pylori is recommended for this reason, in patients undergoing gastric bypass procedure. The benefits for patients undergoing other types of surgeries is controversial.[64] Screening investigations for malignancy should also be considered prior to bariatric surgery due to the association between certain malignancies and obesity. This may include screening colonoscopy for malignancy in patients 50 years of age and over, mammography and Pap smears in appropriate candidates.[56–58]

Risk of thromboembolism: The 90-day incidence of venous thromboembolism after bariatric surgery is 0.42 %. Although uncommon, the clinical consequences can be devastating. Up to 40% of perioperative deaths may be attributed to pulmonary embolism. This remains one of the most common cause of perioperative death along with myocardial infarction and sepsis from anastomotic leak.[59] Prophylaxis with low molecular weight heparin to prevent thromboembolism postoperatively after gastric bypass is common practice. The prophylactic use of an inferior vena cava filter is no longer recommended, even in patients at high risk of pulmonary embolism, as it is associated with increased risk of postoperative deep vein thrombosis and overall mortality without decreasing the risk of pulmonary embolism.[60]

Other consideration: Patients with obesity are at increased risk for several gastrointestinal, hepatobiliary and intra-abdominal processes. Evaluation of the bariatric surgical patient with an abdominal ultrasound is not routinely recommended, except in those patients requiring an investigation for symptomatic biliary disease and elevated liver enzymes or nonalcoholic fatty liver disease.[65]

Following bariatric surgery, decreases in bone density may be observed due to bone loss. Mixed restrictive and malabsorptive procedures such as Roux-en-Y gastric bypass and biliopancreatic diversion are at increased risk for bone fractures. Sleeve gastrectomy may result in bone loss to a lesser degree. Bone loss post-bariatric surgery may be attributed to many factors including nutritional factors, skeletal unfolding, calciotropic hormone abnormalities, body and bone marrow fat changes, and changes in gut hormones. Baseline bone density evaluation may be considered prior to bariatric surgery and two years post bariatric surgery depending on risk factors, which include postmenopausal women, older men, patients with prior fragility fractures or a family history of osteoporosis. Vitamin D and parathyroid hormone levels may be obtained preoperatively in the screening for patients at risk for metabolic bone disease.[66]

Medication considerations

Prior to bariatric surgery, patients need to receive instructions and general precautions surrounding their medications. Avoidance of aspirin may be required prior to surgery in patients taking it for primary prevention. In addition, anti-inflammatory agents must be discontinued prior to surgery. The utilization of these agents postoperatively will depend on their indication, risk tolerance and the surgical procedure. Chronic use of non-steroidal anti-inflammatory drugs is contra-indicated for Roux-en-Y Gastric bypass, due to the risk of anastomotic ulcer. Anti-platelet and anticoagulant medication will also require cessation prior to surgery. In some cases, bridging anticoagulation may be necessary. The use of direct oral anticoagulants whose absorption is not dependent on low Ph conditions may be considered for anticoagulation post-sleeve gastrectomy. The efficacy of direct oral anticoagulants post Roux-en-Y gastric bypass is uncertain, and hence vitamin K antagonists like warfarin remain the preferred oral agent for anticoagulation.[67] Patients should be made aware of the need to switch to vitamin K antagonists after bypass procedures.

Immune modulating medication used in the treatment of connective tissue and inflammatory disorders, skin disorders, and immune-mediated gastrointestinal diseases may need to be held prior to surgery as well as postoperatively for a period of time, at the discretion of the prescribing specialist.

Long-acting release medications may need to be converted after bariatric surgery to short-acting preparations. Medications dependent upon absorption or an acid environment within the stomach and upper gastrointestinal tract may need to be re-evaluated, as well.[68–70] Certain medications may need to be crushed, while encapsulated formulations may need to be opened in the early post-operative period. A comprehensive pharmacologic consultation prior to surgery should be considered.

Women taking estrogen therapy in the form of oral contraception should discontinue their medication four weeks prior to surgery while postmenopausal women may discontinue hormone replacement therapy three weeks prior to surgery.[71]

Preoperative management of patients living with diabetes

In preparation for bariatric surgery, blood glucose readings of patients living with T2DM should be optimized. Reevaluation of the comprehensive care plan should be undertaken, as well as reevaluation of their dietary intake, activity level and the status of other pharmacotherapy. Existing guidelines recommend targets for diabetic glycemic control with the hope of improving bariatric surgical outcomes. Suggested targets include A1c less than 7%, fasting blood sugar level less than 6.1 mmol/L, and a two-hour postprandial blood sugar of 7.7 mmol/l. However, there is limited data guiding the management of glycemic control in bariatric surgery, both preoperatively and postoperatively. With other surgeries, such as orthopedic and colorectal surgery, an elevated A1C preoperatively may be associated with prolonged length-of-stay postoperatively and worsened postoperative outcomes.[97–101]

Elevated blood sugars prior to surgery may be associated with increased postoperative complications, decreased weight loss and less resolution of the patient's T2DM.[102]

Randomized controlled trials suggest that neither intensive management of patients' glycemic control three months prior to Roux-en-Y

gastric bypass, nor intensive control of glycemia in the first two weeks postoperatively, resulted in better hemoglobin A1c levels one year after surgery.[103]

Less aggressive blood glucose targets may be required prior to bariatric surgery, as often bariatric surgical patients with T2DM have high insulin resistance, resulting in suboptimal control.[104] While the patient with T2DM is on a controlled VLCD in preparation for bariatric surgery, reevaluation of their diabetic medications should be undertaken, as a patient's requirements for medication to control blood sugars may be significantly altered. For diet-controlled patients with T2DM, no significant interventions are required.

Avoiding sulfonylureas and meglitinides while on VLCD should be considered to avoid hypoglycemia. In addition, sodium glucose co-transporter 2 inhibitors should be stopped while on a VLCD due to the risk of diabetic ketoacidosis.[105] Alpha-glucosidase, alpha-amylase enzyme inhibitors and thiazolidinediones may be stopped during this period of time. In addition, dipeptidyl peptidase-4 inhibitors and glucagon-like peptide 1 (GLP-1) agonists may also be held, especially with adequate blood sugar control.

Insulin requirements while on meal replacement therapy in preparation for surgery drop dramatically. Intermediate and long-acting insulin require a decreased dose, often by 50%, and short-acting insulins require significant readjustment, as well.[106,107] Frequent blood sugar monitoring is required while on VLCDs in preparation for bariatric surgery. Symptomatic hypoglycemia is treated in the usual fashion.[108]

While on meal replacement therapy, there may be an increased risk of intravascular volume depletion. Close observation of a patient's volume status, electrolytes and kidney function is a prudent and cautious approach.[109] Diuretics should be dose adjusted or held. In addition, close evaluation of blood pressure readings is required, and adjustment to antihypertensive medication may be necessary.[110] Patients with hypertension on blood pressure medication and concurrent meal replacement therapy should be educated about the possibility of developing orthostatic hypotension.

Individuals on meal replacement therapy and warfarin may also require closer observation of their INR level.[111,112]

Conclusion

Bariatric surgery is a life-altering and effective obesity management intervention. Several considerations must be undertaken to prepare a potential candidate for surgery. The patient's medical, mental, nutritional and functional health should be evaluated prior to surgery. Once adequate evaluation, preparation and optimization have been undertaken, establishing an acceptable perioperative risk profile, the patient may proceed with bariatric surgery.

The summary of the Canadian Adult Obesity Clinical Practice Guideline is published in the Canadian Medical Association Journal, and contains information on the full methodology, management of authors' competing interests, a brief overview of all recommendations and other details. More detailed guideline chapters are published on the Obesity Canada website at www.obesitycanada.ca/guidelines.

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