Case Study: A Patient With Diabetes and Weight-Loss Surgery

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Case Presentation

A.W. is a 65-year-old man with type 2 diabetes who was referred by his primary care physician to the weight center for an evaluation of his obesity and recommendations for treatment options, including weight-loss surgery. The weight center has a team of obesity specialists, including an internist, a registered dietitian (RD), and a psychologist, who perform a comprehensive initial evaluation and make recommendations for obesity treatment. A.W. presented to the weight center team reluctant to consider weight-loss surgery; he is a radiologist and has seen patients who have had complications from bariatric surgery.

Pertinent medical history. A.W.'s current medications include 30 and 70 units of NPH insulin before breakfast and before or after dinner, respectively, 850 mg of metformin twice daily, atorvastatin, lisinopril, nifedipine, allopurinol, aspirin, and an over-the-counter vitamin B_{12} supplement. He has sleep apnea but is not using his continuous positive airway pressure machine. He reports that his morning blood glucose levels are 100–130 mg/dl, his hemoglobin A_{1c} (A1C) level is 6.1%, which is within normal limits, his triglyceride level is 201 mg/dl, and serum insulin is 19 ulU/ml. He weighs 343 lb and is 72 inches tall, giving him a BMI of 46.6 kg/m^2.

Weight history. A.W. developed obesity as a child and reports having gained weight every decade. He is at his highest adult weight with no indication that medications or medical complications contributed to his obesity. His family history is positive for obesity; his father and one sister are also obese.

Dieting history. A.W. has participated in both commercial and medical weight-loss programs but has regained any weight lost within months of discontinuing the programs. He has seen an RD for weight loss in the past and has also participated in a hospital-based, dietitian-led, group weight-loss program in which he lost some weight but regained it all. He has tried many self-directed diets, but has had no significant weight losses with these.

Food intake. A.W. eats three meals a day. Dinner, his largest meal of the day, is at 7:30 P.M. He usually does not plan a mid-afternoon snack but will eat food if it is left over from work meetings. He also eats an evening snack to avoid hypoglycemia. He reports eating in restaurants two or three times a week but says his fast-food consumption is limited to an occasional breakfast sandwich from Dunkin' Donuts. His alcohol intake consists of only an occasional glass of wine. He reports binge eating (described as eating an entire large package of cookies or a large amount of food at work lunches even if he is not hungry) about once a month, and says it is triggered by stress.

Social history. Recently divorced, A.W. is feeling depressed about his life situation and has financial problems and stressful changes occurring at work. He recently started living with his girlfriend, who does all of the cooking and grocery shopping for their household.

Motivation for weight loss. A.W. says he is concerned about his health and wants to get his life back under control. His girlfriend, who is thin and a healthy eater, has also been concerned about his weight. His primary care physician has been encouraging him to explore weight-loss surgery; he is now willing to learn more about surgical options. He says that if the weight center team's primary recommendation is for weight-loss surgery, he will consider it.

Questions

1. Does A.W. have contraindications to weight-loss surgery, and, if not, does he meet the criteria for weight-loss surgery?
2. What type of weight-loss surgery would be best for A.W.?

Discussion

Roles of the obesity specialist team members

The role of the physician as an obesity specialist is to identify and evaluate obesity-related comorbidities and to exclude medically treatable causes of obesity. The physician assesses any need to adjust medications and, if possible, determines if the patient is on a weight-promoting medication that may be switched to a less weight-promoting medication.

The psychologist evaluates weight-loss surgery candidates for a multitude of factors, including the impact of weight on functioning, current psychological symptoms and stressors, psychosocial history, eating disorders, patients' treatment preferences and expectations, motivation, interpersonal consequences of weight loss, and issues of adherence to medical therapies.

The RD conducts a nutritional evaluation, which incorporates anthropometric measurements including height (every 5 years),

weight (using standardized techniques and involving scales in a private location that can measure patients who weigh > 350 lb), neck circumference (a screening tool for sleep apnea), and waist circumference for patients with a BMI < 35 kg/m^2. Other assessments include family weight history, environmental influences, eating patterns, and the nutritional quality of the diet. A thorough weight and dieting history is taken, including age of onset of overweight or obesity, highest and lowest adult weight, usual weight, types of diets and/or previous weight-loss medications, and the amount of weight lost and regained with each attempt.[1]

Importance of type of obesity

Childhood- and adolescent-onset obesity lead to hyperplasic obesity (large numbers of fat cells); patients presenting with hyperplasic and hypertrophic obesity (large-sized fat cells), as opposed to patients with hypertrophic obesity alone, are less likely to be able to maintain a BMI < 25 kg/m^2, because fat cells can only be shrunk and not eliminated. This is true even after weight-loss surgery and may contribute to the variability in weight loss outcomes after weight loss surgery. Less than 5% of patients lose 100% of their excess body weight.[2,3]

Criteria and contraindications for weight-loss surgery

In 1998, the "Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report"[4] recommended that weight-loss surgery be considered an option for carefully selected patients:

- with clinically severe obesity (BMI ≥ 40 kg/m^2 or ≥ 35 kg/m^2 with comorbid conditions);
- when less invasive methods of weight loss have failed; and
- the patient is at high risk for obesity-associated morbidity or mortality.

Contraindications for weight-loss surgery include end-stage lung disease, unstable cardiovascular disease, multi-organ failure, gastric verices, uncontrolled psychiatric disorders, ongoing substance abuse, and noncompliance with current regimens.

A.W. had no contraindications for surgery and met the criteria for surgery, with a BMI of 46.6 kg/m^2. He had made numerous previous attempts at weight loss, and he had obesity-related comorbidities, including diabetes, sleep apnea, hypertension, and hypercholesterolemia.

Types of procedures

The roux-en-Y gastric bypass (RYGB) surgery is the most common weight-loss procedure performed in the United States. However, the laparoscopic adjustable gastric band (LAGB) procedure has been gaining popularity among surgeons. Both procedures are restrictive, with no malabsorption of macronutrients. There is, however, malabsorption of micronutrients with the RYGB resulting from the bypassing of a major portion of the stomach and duodenum. The bypassed portion of the stomach produces the intrinsic factor needed for the absorption of vitamin B_{12}. The duodenum is where many of the fat-soluble vitamins, B vitamins, calcium, and iron are absorbed. Patients undergoing RYGB must agree to take daily vitamin and mineral supplementation and to have yearly monitoring of nutritional status for life.

Weight loss after RYGB and LAGB

The goal of weight-loss surgery is to achieve and maintain a healthier body weight. Mean weight loss 2 years after gastric bypass is ~ 65% of excess weight loss (EWL), which is defined as the number of pounds lost divided by the pounds of overweight before surgery.[5] When reviewing studies of weight-loss procedures, it is important to know whether EWL or total body weight loss is being measured. EWL is about double the percentage of total body weight loss; a 65% EWL represents about 32% loss of total body weight.

Most of the weight loss occurs in the first 6 months after surgery, with a continuation of gradual loss throughout the first 18–24 months. Many patients will regain 10–15% of the lost weight; a small number of patients regain a significant portion of their lost weight.[6] Data on long-term weight maintenance after surgery indicate that if weight loss has been maintained for 5 years, there is a > 95% likelihood that the patient will keep the weight off over the long term.

The mean percentage of EWL for LAGB is 47.5%.[3] Although the LAGB is considered a lower-risk surgery, initial weight loss and health benefits from the procedure are also lower than those of RYGB.

Weight-loss surgery and diabetes

After gastric bypass surgery, there is evidence of resolution of type 2 diabetes in some individuals, which has led some to suggest that surgery is a cure.[7] Two published studies by Schauer et al.[8] and Sugarman et al.[9] reported resolution in 83 and 86% of patients, respectively. Sjoström et al.[10] published 2- and 10-year data from the Swedish Obese Subjects (SOS) study of 4,047 morbidly obese subjects who underwent bariatric surgery and matched control subjects. At the end of 2 years, the incidence of diabetes in subjects who underwent bariatric surgery was 1.0%, compared to 8.0% in the control subjects. At 10 years, the incidence was 7.0 and 24.0%, respectively.

The resolution of diabetes often occurs before marked weight loss is achieved, often days after the surgery. Resolution of diabetes is more prevalent after gastric bypass than after gastric banding (83.7% for gastric bypass and 47.9% for gastric banding).[5] The LAGB requires adjusting (filling the band through a port placed under the skin), usually five to six times per year. Meta-analysis of available data shows slower weight loss and less improvement in comorbidities including diabetes compared to RYGB.[5]

A.W. had diabetes; therefore, the weight center team recommended the RYGB procedure.

Case study follow-up

A.W. had strong medical indications for surgery and met all other criteria outlined in current guidelines.[4] He attended a surgical orientation session that described his surgical options, reviewed the procedures

(including their risks and possible complications), and provided him the opportunity to ask questions. This orientation was led by an RD, with surgeons and post–weight-loss surgical patients available to answer questions. After attending the orientation, A.W. felt better informed about the surgery and motivated to pursue this treatment.

The weight center evaluation team referred him to the surgeon for surgical evaluation. The surgeon agreed with the recommendation for RYGB surgery, and presurgical appointments and the surgery date were set. The surgeon encouraged A.W. to try to lose weight before surgery.[11]

Immediately post-surgery. The surgery went well. A.W.'s blood glucose levels on postoperative day 2 were 156 mg/dl at 9:15 A.M. and 147 mg/dl at 11:15 A.M. He was discharged from the hospital on that day on no diabetes medications and encouraged to follow a Stage II clear and full liquid diet (Table 1).[12]

On postoperative day 10, he returned to the weight center. He reported consuming 16 oz of Lactaid milk mixed with sugar-free Carnation Instant Breakfast and 8 oz of light yogurt, spread out over three to six meals per day. In addition, he was consuming 24 oz per day of clear liquids containing no sugar, calories, or carbonation. A.W.'s diet was advanced to Stage III, which included soft foods consisting primarily of

Table 1. Diet Stages After RYBG Surgery

Diet Stage*	Timing	Intake
Stage 1	Postoperative day 1 and 2	Clear liquids that are noncarbonated and contain no calories or caffeine
Stage II**	Postoperative day 3 (discharge diet)	24 oz or more of clear liquids, including calorie-free and salty liquids, such as broths, and more solid "liquids," such as diet Jello, plus 24 oz or more of "full" liquids < 25 g or sugar per serving, such as 1% or skim milk, light blended yogurt, diet pudding, whey protein powder (limited to 20 g of protein per serving)
Stage III	Postoperative days 10–14	Clear liquids increased to 48–64 oz per day and full liquids replaced with soft, moist, diced, ground, or pureed protein sources as tolerated
Stage III	Diet advanced as tolerated	60 g of protein per day, plus well-cooked, soft vegetables or soft peeled fruit at meals. Diet is advanced as tolerated with hydration as the first priority. Protein is to be consumed at 1–2 oz per meal or snack, with amounts advanced as tolerated
Stage III	Diet advanced as tolerated	Reintroduction of raw salads 1 month after surgery, and gradual addition of whole-grain carbohydrates as hunger increases, with protein, fruits, and vegetables taking priority
Stage IV (with continuing daily vitamin and mineral supplementation)	Diet advanced as hunger increases and more food is tolerated	Healthy solid-food diet consisting of adequate protein, fruits, vegetables, and whole grains

**There is no standardization of diet stages; there are a wide variety of nutrition therapy protocols for how long patients should stay on each stage and what types of fluids and foods are recommended.*
***Supplementation with two chewable multivitamins with minerals and chewable or liquid calcium citrate with vitamin D.*
Adapted from Ref. 12.

protein sources (diced, ground, moist meat, fish, or poultry; beans; and/or dairy) and well-cooked vegetables. He also attended a nutrition group every 3 weeks, at which the RD assisted him in advancing his diet.

Two months post-surgery. A.W. was recovering well; he denied nausea, vomiting, diarrhea, or constipation. He was eating without difficulty and reported feeling no hunger. His fasting and pre-dinner blood glucose levels were consistently < 120 mg/dl, with no diabetes medications. He continued on allopurinol and atorvastatin and was taking a chewable daily multivitamin and chewable calcium citrate (1,000 mg/day in divided doses) with vitamin D (400 units). His weight was 293 lb, down 50 lb since the surgery. A pathology report from a liver biopsy showed mild to moderate steatatosis without hepatitis.

One year post-surgery. A.W.'s weight was 265 lb, down 78 lb since the surgery, and his weight loss had significantly slowed, as expected. He was no longer taking nifedipine or lisinipril but was restarted at 5 mg daily to achieve a systolic blood pressure < 120 mmHg. His atorvastatin was stopped because his blood lipid levels were appropriate (total cholesterol 117 mg/dl, triglycerides 77 mg/dl, HDL cholesterol 55 mg/dl, and LDL cholesterol 47 mg/dl). His gastroesophageal reflux disease has been resolved, and he continued on allopurinol for gout but had had no flare-ups since surgery. Knee pain caused by osteoarthritis was well controlled without anti-inflammatory medications, and he had no evidence of sleep apnea. Annual medical follow-up and nutritional laboratory measurements will include electrolytes, glucose, A1C, albumin, total protein, complete blood count, ferritin, iron, total iron binding capacity, calcium, parathyroid hormone, vitamin D, magnesium, vitamins B_1 and B_{12}, and folate, as well as thyroid, liver, and kidney function tests and lipid measurements.

In summary, A.W. significantly benefited from undergoing RYBP surgery. By 1 year post-surgery, his BMI had decreased from 46.6 to 35.8 kg/m^2, and he continues to lose weight at a rate of ~ 2 lb per month. His diabetes, sleep apnea, and hypercholesterolemia were resolved and he was able to control his blood pressure with one medication.

Clinical Pearls

- Individuals considering weight loss surgery require rigorous presurgical evaluation, education, and preparation, as well as a comprehensive long-term postoperative program of surgical, medical, nutritional, and psychological follow-up.
- Individuals with diabetes should consider the RYBP procedure because the data on resolution or significant improvement of diabetes after this procedure are very strong, and such improvements occur immediately. Resolution in or improvement of diabetes with the LAGB procedure are more likely to occur only after excess weight has been lost.
- Individuals with diabetes undergoing weight loss surgery should be closely monitored; an inpatient protocol should be written regarding insulin regimens and sliding-scale use of insulin if needed. Patients should be educated regarding self-monitoring of blood glucose and the signs and symptoms of hypoglycemia. They should be given instructions on stopping or reducing medications as blood glucose levels normalize.
- Patient undergoing RYGB must have lifetime multivitamin supplementation, including vitamins B_1, B_{12}, and D, biotin, and iron, as well as a calcium citrate supplement containing vitamin D (1,000 –1,500 mg calcium per day). Nutritional laboratory measurements should be conducted yearly and deficiencies repleted as indicated for the duration of the patient's life.

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