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Resolution of metabolic syndrome after bariatric surgery: a case report

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Abstract

There is a growing level of obesity in developed countries. The metabolic syndrome is a group of risk factors often present in the morbidly obese population that increases the risk of cardiovascular diseases. There has been great interest in the effect of bariatric surgery, particularly gastric bypass, in improving or resolving the metabolic syndrome in most patients. We report the case of a 48-year old woman with morbid obesity (body mass index, 40.5) who underwent a laparoscopic Roux-en-Y gastric bypass. At 12-months follow-up, the patient had lost 27% of excess body weight (body mass index, 29.7) with an improvement or resolution of her blood pressure, lipid profile, liver biochemistry, and glycemic control. ■ Heart Metab. 2014;63:29–32

Keywords: Angina; breathlessness; diet; gastric bypass; metabolic syndrome; obesity.

The metabolic syndrome encompasses a group of risk factors that increases the risk of developing cardiovascular disease, diabetes, and stroke. These risk factors include hyperglycemia, elevated blood pressure, dyslipidemia, and elevated waist circumference. Three out of five risk factors need to be present to make the diagnosis of metabolic syndrome according to the: (i) Joint Interim Statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; (ii) National Heart, Lung, and Blood Institute; (iii) American Heart Association; (iv) World Heart Federation; and (v) International Atherosclerosis Society and International Association for the Study of Obesity *(Table I)*.[1]

The metabolic syndrome is highly prevalent in the morbidly obese and those referred for bariatric surgery. Numerous studies have reported improvements or resolution of diabetes, hypertension, and/or dyslipidemia in the early period after Roux-en-Y gastric bypass surgery, which may be due to a combination

1) Elevated waist circumference: >80 cm in Caucasian women (IDF and WHO).
2) Elevated triglycerides: ≥1.7 mmol/L (or receiving drug treatment for elevated triglycerides).
3) Reduced HDL-C: <1.3 mmol/L in women (or receiving drug treatment for reduced HDL-C).
4) Elevated BP: Systolic ≥130 mm Hg or diastolic ≥85 mm Hg (or receiving drug treatment for hypertension).
5) Elevated fasting glucose: ≥100 mg/dL or 5.5 mmol/L (or receiving drug treatment for elevated glucose).

Table I *Criteria for the clinical diagnosis of metabolic syndrome[1]. The presence of any 3 of 5 risk factors constitutes a diagnosis of metabolic syndrome. After reference 1. Source: American Heart Association, Inc.*

Abbreviations

AHA: American Heart Association; **BMI:** body mass index; **FFR:** fractional flow reserve; **GGT:** gamma glutamyl transpeptidase; **HDL-C:** high-density lipoprotein cholesterol; **IDF:** International Diabetes Federation; **LAD:** left anterior descending artery; **LDL:** low-density lipoprotein; **WHO:** World Health Organization

of weight-dependent and weight-independent mechanisms.[2-4] Further, the benefits of bariatric surgery extend to a reduction in the future estimated cardiovascular disease risk.[5]

We present the case of a morbidly obese patient who presented initially to the cardiology clinic with symptoms of angina. Her case highlights some of the previously documented medium-term benefits of bariatric surgery, but also discusses some of the outstanding issues to sustain the long-term benefit and the role the dietician plays in achieving long-term weight loss.

Case report

A 48-year-old woman was referred to the cardiology service in May 2011 for symptoms of exertional breathlessness and chest tightness. She had no chest pain at rest nor did she report any symptoms of orthopnea or paroxysmal nocturnal dyspnea. She did complain of mild peripheral edema. Her mobility was limited due to osteoarthritis of her right hip and she walked with the aid of a stick.

She had a number of comorbidities including morbid obesity (body mass index [BMI] of 40.5 and a waist circumference of 134 cm), hypertension, depression, and asthma. She was a smoker with a 10 pack/year history. Her blood tests revealed evidence of dyslipidemia and mildly deranged liver biochemistry *(Table II)*. Her electrocardiogram was normal and the troponin test was negative. Her fasting blood glucose was elevated (7.5 mmol/L) and an oral glucose tolerance test revealed her blood glucose level to be 10.8 mmol/L, 2 hours after an oral glucose load, which confirmed the presence of impaired glucose tolerance. A liver ultrasound demonstrated marked echogenicity, which is in line with fatty liver disease. She met all the diagnostic criteria for the metabolic syndrome due to the presence of dyslipidemia, hyperglycemia, and hypertension on treatment as well as an elevated waist circumference, *(Table I)* and was considered at high risk for developing coronary artery disease.

A transthoracic echocardiogram was limited due to body habitus, but revealed normal biventricular function with no regional wall motion abnormalities or valvular heart disease. She proceeded to coronary angiography, which revealed mild-to-moderate

Measure	Preoperative	Postoperative (1 year)	Reference range/targets (females)
Weight (kg)	109	80	see BMI
Body Mass Index	40.5	29.7	18.5 to 25.0
Waist circumference (cm)	134	104	≤80 in Caucasians (WHO/IDF criteria)
Total cholesterol (mmol/L)	6.3	5.4	<4
Triglycerides (mmol/L)	1.86	1.57	<1.70
HDL cholesterol (mmol/L)	1.16	1.32	>1.30
LDL cholesterol (mmol/L)	4.27	3.36	0.00-3.00
Blood pressure (mm Hg)	124/80	112/68	<140/90
Fasting blood glucose (mmol/L)	7.5	5.4	3.9 to 5.5
HbA_{1c} (mmol/mol)	55.2	42.1	20 to 41
Albumin (g/L)	44	42	40 to 52
Bilirubin (µmol/L)	8	3	0 to 21
Alkaline phosphatase (IU/L)	146	72	35 to 129
Alanine transaminase (IU/L)	69	15	4 to 45
Gamma-glutamyl transpeptidase (GGT) (IU/L)	60	24	4 to 60

Table II *Weight, waist circumference, lipid profile, blood pressure, glycemic control, and liver biochemistry pre and 1 year postbaria-tric surgery. The Joint International Diabetes Federation (IDF), National Heart, Lung and Blood Institute (NHLBI), and American Heart Association (AHA) criteria[1] were used to make a diagnosis of the metabolic syndrome. According to these criteria* (Table I)*, the presence of 3 out of 5 risk factors constitutes a diagnosis of metabolic syndrome. Our patients met 5 of the criteria preoperatively and only 1 criterion postoperatively confirming the resolution of metabolic syndrome postbariatric surgery. After reference 1. Source: American Heart Association, Inc.*

atheroma in the left anterior descending artery (LAD), but the fractional flow reserve (FFR) was negative *(Figure 1)*. The rest of her coronary system was clear. Therefore, a decision was made to manage her symptoms medically and advise her on lifestyle interventions.

Fig. 1 *Left and right coronary angiogram performed via the right radial route. The left main stem and left circumflex arteries were unobstructed. The LAD had mild to moderate disease proximal to the first diagonal. The right coronary artery was dominant and unobstructed. The patient proceeded to a pressure wire study of the LAD: after achieving steady state hyperemia with a peripheral infusion of adenosine, the lowest recorded FFR was 0.92 (negative). On pulling back the pressure wire, there was a gradual increase in the FFR to 1.0 back within the left main stem consistent with mild diffuse, but unobstructive disease in the LAD.*
Abbreviations: *FFR, fractional flow reserve; LAD, left anterior descending artery.*

Despite implementing a physical exercise regime and dietary adjustments, the patient's weight remained static over the next 4 months. She continued to experience exertional breathlessness and reported increasing psychosocial stress and low self-esteem due to her weight. She was started on orlistat and lost 3 kg over a 6-week period, but had not achieved her target body weight after 3 months. Orlistat was therefore stopped and she was referred for bariatric surgery. After a full discussion of the risks and benefits, the patient elected to undergo a laparoscopic Roux-en-Y gastric bypass in April 2012. There were no postoperative complications and the patient was discharged on a high-protein, low-fat diet with vitamin, iron, and calcium supplementation.

The patient remained well, and by her 12-month follow-up, had lost 29 kg and demonstrated an improvement in her lipid profile, liver biochemistry, and hyperglycemia *(Table II)*. She was keen to stop the amlodipine for her blood pressure as this was causing her troublesome peripheral edema. Her blood pressure remained within the correct range even after this was stopped, and, now, she only met one criterion from the list of metabolic syndrome criteria *(Table I)*. Therefore, she was considered free from the metabolic syndrome. Most importantly for the patient, she reported an improvement in her cardiorespiratory status with no further symptoms of exertional breathlessness and chest pain and a subsequent improvement in her exercise tolerance and quality of life.

The patient reported that the involvement of the dietician in providing advice on meal frequency, fluid intake, dietary supplements, and behavioral changes significantly helped in the maintenance of weight loss after surgery. She was given detailed nutritional counseling preoperatively, and continued to visit the dietician at 3-monthly intervals postoperatively. She was provided with written information on the importance of lifestyle modifications and had regular telephone consultations to monitor adherence. All of these factors led to a positive effect on her weight-loss outcome and prevented weight regain after surgery.

The role of bariatric surgery in the metabolic syndrome

In our patient, there appeared to be a good outcome across a range of metabolic and functional parameters at 1-year follow-up. Some studies have reported that between 50% to 80% of patients referred for bariatric surgery may fit the criteria for having a diagnosis of metabolic syndrome.[6] There are now multiple reports in the literature suggesting that after bariatric surgery there is either improvement in or resolution of a number of comorbidities including metabolic syndrome, diabetes, hypertension, and obstructive sleep apnea.[7-9] Furthermore, evidence suggests that sustained and substantial weight loss after bariatric surgery is a powerful intervention to decrease the future risk of myocardial infarction and premature death in the morbidly obese.[10] This has led some authors to suggest that bariatric surgery should not only be considered as surgery for morbid obesity, but also as surgery for metabolic disturbances.[8]

While the short- and medium-term benefits of bariatric surgery on dyslipidemia, glycemic control, and hypertension are clear, there appear to be relatively few studies reporting long-term data on the effects of bariatric surgery on remission rates. Recent evidence found that over a 6-year median follow-up period after bariatric surgery, there was a 50% complete or partial type 2 diabetes mellitus remission rate.[11] The STAMPEDE trial (Surgical Treatment And Medications Potentially Eradicate Diabetes Efficiently) recently

Heart Metab. (2014) 63:29–32

reported 3-year outcomes on the effects of bariatric surgery and intensive medical therapy on glycemic control. Patients who underwent bariatric surgery combined with intensive medical therapy had significantly better glycemic control compared with patients who received intensive medical therapy alone. There was also an improvement seen in body weight, use of glucose-lowering medications, and quality of life, which was sustained at the 3-year follow-up.[12]

There are also direct effects of profound weight loss on the heart, which are highlighted and discussed in the article by Oliver Rider in this issue.

Weight regain after bariatric surgery is a well-recognized clinical problem and has been linked to both surgical issues and lifestyle factors.[9] A preclinical model of weight regain after Roux-en-Y gastric bypass suggested that around 20% of individuals may regain a large proportion of weight initially lost and reenter the category of morbid obesity.[13] The dietician may play a key role in preventing weight regain after bariatric surgery through provision of practical nutrition knowledge, guidance, and encouragement of physical activity and promoting sustained lifelong changes in eating behaviors.[9]

Conclusions

Obesity and its associated complications are an ever increasing clinical problem in developed countries. Bariatric surgery leads to an improvement in metabolic disturbances in addition to its effects on weight loss in the morbidly obese. The role of allied healthcare professionals, particularly the dietician, is important in maintaining weight loss after bariatric surgery and promoting lifelong changes in eating behaviors. ■

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