Metabolic syndrome: yet another co-morbidity gastric bypass helps cure

Atul K. Madan, M.D., F.A.C.S.a,b,*, Whitney Orth, M.S., R.D.b, Craig A. Ternovits, M.D.a, David S. Tichansky, M.D.a,b

aSection of Minimally Invasive Surgery, Department of Surgery, University of Tennessee Health Science Center, Memphis, Tennessee
bWeight Management Center, Methodist University Hospital, Memphis, Tennessee

Abstract

Background: The metabolic syndrome is a group of risk factors predictive of cardiovascular diseases. The rising number of obese Americans has increased the prevalence of metabolic syndrome. This study investigated the hypothesis that the incidence of metabolic syndrome is decreased after laparoscopic gastric bypass surgery.

Methods: The charts of all patients who had undergone laparoscopic gastric bypass surgery during a 6-month period were reviewed for the presence of the diagnostic criteria for metabolic syndrome, both preoperatively and at least 1 year postoperatively. The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria were used to define the metabolic syndrome. These criteria included elevated blood pressure, fasting blood glucose, triglycerides, high-density lipoprotein cholesterol, and waist circumference.

Results: Data were available for 53 patients. Before laparoscopic gastric bypass surgery, 32 (60%) of the 53 patients had metabolic syndrome, as defined by the NCEP ATP III criteria. No difference was found in the preoperative body mass index between patients who had metabolic syndrome (47.4 kg/m²) and those who did not (49.8 kg/m²; P = NS). The percentage of excess body weight lost after at least 1 year was 78% in patients with metabolic syndrome. After surgery, only 1 (2%) of the 53 patients had metabolic syndrome (P < .0001).

Conclusion: Metabolic syndrome is quite common in patients undergoing bariatric surgery. The results of our study have shown that laparoscopic gastric bypass surgery resolves metabolic syndrome in most patients. Metabolic syndrome should be considered another co-morbidity that improves and is cured after gastric bypass surgery. © 2006 American Society for Bariatric Surgery.

Keywords: Laparoscopic gastric bypass; Metabolic syndrome; Bariatric surgery; Morbid obesity

Despite the recent focus, the idea of metabolic syndrome has been discussed in published reports as early as the 1920s [1]. It was not until 1947 that android obesity associated

Presented in part at the Allied Health Section of the 22nd Annual Meeting of the American Society for Bariatric Surgery, Orlando, Florida, June 26–July 1, 2005.

*Reprint requests: Atul K. Madan, M.D., F.A.C.S., Section of Minimally Invasive Surgery, Division of General Surgery, Department of Surgery, University of Tennessee Health Science Center, 956 Court Avenue, Room G210, Memphis, TN 38163.
E-mail: amadan@utmem.edu

1550-7289/06/$ – see front matter © 2006 American Society for Bariatric Surgery. All rights reserved.
hypertension, obesity, dyslipidemia, obstructive sleep apnea, degenerative joint disease, and depression. It is not surprising that morbid obesity and metabolic syndrome are strongly associated with each other. Currently, the major management of metabolic syndrome involves lifestyle changes such as increase in physical activity and better dietary choices and has been shown to be effective [6]. Because resolution and/or improvement of obesity-associated co-morbidities occur after bariatric surgery [7–9], it is not surprising that the metabolic syndrome may improve after bariatric surgery.

This study sought to note the effect of laparoscopic gastric bypass surgery on metabolic syndrome. We tested the hypothesis that the incidence of metabolic syndrome would be decreased after laparoscopic gastric bypass surgery.

**Methods**

We performed a review of the charts all patients who had undergone laparoscopic gastric bypass surgery within a 6-month period. Our institutional review board approved this study. The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII) criteria were used to define metabolic syndrome (Table 1). Patients who were being treated with antihypertensive and diabetic medications were considered to have the respective NCEP ATPIII criterion. Patients with normal blood pressure and normal fasting blood glucose and not needing the respective medication were not considered to have met the respective NCEP ATPIII criterion. If patients had three or more criteria (even if data for all criteria were not available), they were considered to have the metabolic syndrome. If patients did not have three or more criteria (even if data for all criteria were not available), they were considered not to have metabolic syndrome.

All patients underwent a laparoscopic gastric bypass procedure with a varying Roux limb: 100 cm for patients with a body mass index (BMI) ≤50 kg/m², 150 cm for patients with a BMI of 50–60 kg/m², and 220 cm for patients with a BMI >60 kg/m². Each laparoscopic gastric bypass procedure was performed with a circular stapled, antecolic, and antegastric gastrojejunostomy. The postoperative follow-up regimen included examinations at 1 week, 1 month, 3 months, 6 months, and 1 year and yearly thereafter.

Only patients who had available data (both preoperatively and 1 year postoperatively) were included in this study. The demographic data were compared between the group who had metabolic syndrome and the group who did not. Fisher’s exact test and the two-tailed Mann-Whitney U test were used as needed with GraphPad InStat, version 3.05 (San Diego, CA).

**Results**

A total of 104 patients had undergone laparoscopic gastric bypass surgery, with complete data available for 53. Before laparoscopic gastric bypass surgery, 32 (60%) of the 53 patients had metabolic syndrome as defined by the NCEP ATPIII criteria. No difference was found in the preoperative BMI between those who had metabolic syndrome (47.4 kg/m²) and those who did not (49.8 kg/m²; P = NS). Similarly, the preoperative weight, waist/hip ratio, gender, and age did not predict for metabolic syndrome (Table 2).

The percentage of excess body weight loss after at least 1 year was 78% in patients with metabolic syndrome. The difference in the percentage of excess body weight loss was not statistically significant between those who had metabolic syndrome and those who did not (Table 2). The postoperative weight and total weight loss did not differ be-
Our data have demonstrated that metabolic syndrome is a common disease among obese patients. Thus, all potential bariatric patients should undergo appropriate preoperative workup to diagnose those who may not already be known to have metabolic syndrome. At follow-up, patients should also be checked for the resolution of the metabolic syndrome. Although excess body weight loss is the most prevalent and easiest method of determining the success of an operation, the resolution of co-morbidities should always be explored and reported.

**Discussion**

Metabolic syndrome is quite common in patients undergoing bariatric surgery. In our study, laparoscopic gastric bypass surgery resolved the metabolic syndrome in almost all patients. Another study demonstrated a similar effect of laparoscopic bariatric surgery on metabolic syndrome [10]. One concern with that study was that it was performed in Taiwan. Because ethnicity can affect the prevalence of metabolic syndrome, it was not known whether their results would be transferable to the North American population. Our data help support the notion that metabolic syndrome is lasting. Because the NIH guidelines suggest that patients with a BMI of 35–40 kg/m² and a co-morbidity qualify for surgery [14], the presence of the metabolic syndrome should be considered in any patient who desires bariatric surgery and has a BMI of 35–40 kg/m².

Our data have shown that metabolic syndrome is a common disease among obese patients. Thus, all potential bariatric patients should undergo appropriate preoperative workup to diagnose those who may not already be known to have metabolic syndrome. At follow-up, patients should also be checked for the resolution of the metabolic syndrome. Although excess body weight loss is the most prevalent and easiest method of determining the success of an operation, the resolution of co-morbidities should always be explored and reported.

**Conclusion**

Laparoscopic gastric bypass surgery can be offered as a potential cure for metabolic syndrome. In fact, laparoscopic gastric bypass surgery should not be considered as only surgery for morbid obesity but also as surgery for metabolic disturbances.

**References**

Dr. Madan and his coauthors are to be congratulated for a short, concise and well-referenced article that documents the resolution of the metabolic syndrome following weight loss after laparoscopic gastric bypass. Bariatric surgeons recognize that morbid obesity is characterized by insulin resistance, hyperinsulinemia, hyperglycemia, coronary artery disease, hypertension, and hyperlipidemia. Substrate overload leads to baseline resistance to pancreatic polypeptides, which in turn forces rapid loss of muscle mass and early deconditioning during the postoperative period. What is striking is that the inflammation, hypercoagulability, and insulin resistance that characterize obesity as a disease process mimic critical illness. Adipose tissue is a potent source of tumor necrosis factor α and interleukin-6. Neutrophils of obese patients have impaired chemotaxis and activation [1]. Obese patients have increased concentrations of fibrinogen and plasminogen activator inhibitor-1, as well as decreased concentration of antithrombin-III and decreased fibrinolysis [2]. Thus, obesity is a chronic inflammatory state that diminishes both immune and metabolic reserves. Increased body mass index (BMI) requires increased cardiovascular, respiratory, and metabolic work, resulting in a markedly diminished physiologic reserve. This combination, in association with the high prevalence of the metabolic syndrome, makes any serious complication after weight loss surgery potentially lethal. As the authors have noted (and in accord with my experience), preoperative weight, waist-to-hip ratio, gender, and age do not predict metabolic syndrome. Although not mentioned in this article, the metabolic syndrome is clearly a hepatotoxic condition. The metabolic syndrome may act in conjunction with the more common hepatotoxic conditions, alcohol and hepatitis C, in producing a synergistic effect on liver dysfunction [3,4].

Although the authors vary their Roux limb length in proportion to BMI (and leave this without comment in their article), I believe that duodenal switch may be a better surgical option to improve sustained postoperative weight loss that is less than satisfactory in superobese patients [5,6]. Nonetheless, as the authors note, the metabolic syndrome improves significantly with the lesser weight loss of gastric banding and even with just diet and lifestyle manipulation.

The argument that the metabolic syndrome is a comorbidity that warrants consideration of weight loss surgery in patients with BMI between 35 and 40 merits discussion, but is not supported by the data in this article. Nonetheless, clearly, from a public health perspective, treating the metabolic syndrome by weight reduction and early prevention of obesity should be a priority.

Alfons Pomp, M.D., F.R.C.S.C., F.A.C.S.
Section of Laparoscopic and Bariatric Surgery
Joan and Sanford I. Weill Medical College of Cornell University
New York Presbyterian Hospital
New York, New York

References