Laparoscopic sleeve gastrectomy: Effect on long-term remission for morbidly obese patients with type 2 diabetes at 5-year follow up

Marius Nedelcu, MD,[a,b,c] **Marcelo Loureiro, MD,**[a,b,d] **Mehdi Skalli, MD,**[a,b] **Florence Galtier, MD,**[a] **Audrey Jaussent, MD,**[a] **Melanie Deloze, MD,**[a] **Michel Gagner, MD, FRCSC, FACS, FASMBS,**[e] **Jean Michel Fabre, MD, PhD,**[a,b] *and* **David Nocca, MD, PhD,**[a,b] *Montpellier and Toulon, France, Curitiba, Brazil, and Montréal, Canada*

Background. *In the short-term, laparoscopic sleeve gastrectomy has been shown to be effective for the treatment of the type 2 diabetes in patients with severe obesity. There are few data with greater follow-up. Our aim was to evaluate the results of laparoscopic sleeve gastrectomy on the control of type 2 diabetes in patients with severe obesity at 5 years at the University Hospital, France.*

Methods. *From a total of 355 patients with severe obesity operated between January 2006 and June 2010, 52 (15%) had a diagnosis of type 2 diabetes before undergoing laparoscopic sleeve gastrectomy.*

Results. *There were 31 females (60%) and 21 males (40%), with a mean age of 51 ± 10 years (range 27–67) with a mean body mass index of 48 ± 10 kg/m^2 (range 35–82). The mean duration of type 2 diabetes was 10.8 ± 10.8 years before bariatric operation. The preoperative glycated hemoglobin was 8 ± 2% (range 5.9–12.8) in 45 patients; 17 patients (38%) had levels of glycated hemoglobin ≥ 9%. Three patients (6%) required insulin alone, 4 (8%) were taking oral antidiabetic medicine and insulin, and the remaining 45 patients (87%) were taking only oral antidiabetic medicines. The complete data regarding weight loss at 5-year follow-up were obtained for 46 patients, yielding an overall follow-up rate of 89%. The prolonged remission of type 2 diabetes achieved at 1 year that persisted at 5 years of follow-up was present in 9 patients (17%). No patient with complete remission of their type 2 diabetes required insulin preoperatively. Improvement of type 2 diabetes was observed in 30 patients (58%) at 1 year, which was maintained for 27 patients (52%) at 5-year follow-up.*

Conclusion. *Laparoscopic sleeve gastrectomy has demonstrated a moderate efficacy in the treatment morbidly obese patients with type 2 diabetes. Markedly increased preoperative glycated hemoglobin levels, older age, and preoperative need for insulin treatment may be the factors predicting failure of complete remission of type 2 diabetes after laparoscopic sleeve gastrectomy. (Surgery 2017;■:■-■.)*

From the Centre Hospitalier Universitaire Montpellier,[a] *Montpellier, France; Université de Montpellier 1,*[b] *Montpellier, France; Centre Chirurgical de l'Obesite,*[c] *Clinique Saint Michel, Toulon, France; Universidade Positivo,*[d] *Curitiba, Brazil; Hôpital Du Sacre Cœur,*[e] *Montréal, Canada*

Drs Nedelcu, Loureiro, Skalli, Galtier, Jaussent, and Fabre have no conflicts of interest or financial ties to disclose. Dr Nocca has honorarium for speaking engagements from Ethicon Endosurgery, MID, Gore, and MSD. Dr Gagner has honorarium for speaking engagements from Ethicon Endosurgery, Covidien, Olympus, MID, Transenterix, Gore, and Boehringer Labs. For the remaining authors none were declared.

Accepted for publication February 20, 2017.

Reprint requests: Marius Nedelcu, MD, Service de Chirurgie Digestive A, Pôle Digestif, Hôpital Saint Eloi, Université de Montpellier, 80, Avenue Augustin Fliche, Montpellier 34295 France. E-mail: nedelcu.marius@gmail.com.

0039-6060/$ - see front matter

http://dx.doi.org/10.1016/j.surg.2017.02.018

The most recent global predictions by the International Diabetes Federation suggest there are 285 million people currently with diabetes worldwide. This prevalence of diabetes is thought to increase to 438 million by 2030,[1] with another half billion people at high risk. Diabetes is one of the greatest public health threats of the 21st century. The relationship between obesity and type 2 diabetes (T2D) is well known, and up to one-third of patients presenting for bariatric operation are known to have diabetes.[2] In France, about 20% of patients who have undergone bariatric procedures to treat morbid obesity have T2D.[3]

The risk of T2D increases with body mass index (BMI) from 2% among those with of BMI 25 to

29.9 kg/m^2 to 13% if BMI is >35 kg/m^2. Patients with a BMI >35 kg/m^2 have a risk of diabetes about 40 times greater than people with BMI <23 kg/m^2.[4] Increasing evidence suggests that health of obese persons with T2D, including metabolic control of diabetes and its associated risk factors, can benefit substantially from bariatric operation.[5,6]

The goals of bariatric operation evolved originally around achieving a sustained weight loss. In reality, weight loss is only one of the outcomes of bariatric operation. Bariatric operation can be associated with substantial other health benefits, including improvement or normalization of hyperglycemia, hyperlipidemia, blood pressure, obstructive sleep apnea, and improved quality of life.[7]

In view of the broad benefits of weight loss and the growing evidence that some bariatric procedures provide metabolic benefits that cannot be explained completely by their effects on body weight alone,[8] the name "bariatric–metabolic surgery" is emerging as a more appropriate name.

In the short-term, laparoscopic sleeve gastrectomy (LSG) is effective for the treatment of the T2D in patients with severe obesity.[9] It decreases glycemia shortly after operation by changing gastric emptying, modifying circulating levels of several gut hormones, and also by altering feeding habits and caloric consumption. One year after operation, LSG seems to be as effective as laparoscopic Roux-en-Y gastric bypass (RYGB) for the management of T2D in severely obese patients.[10,11] There were few data with greater durations of follow-up.

The aim of our present study is to evaluate the results of LSG on the control of T2D in patients with severe obesity at 5-year follow-up.

METHODS

A retrospective, observational, monocentric study was conducted at Montpellier University Hospital (CHU de Montpellier, France). Since 2005, a database with all bariatric operation information including weight loss, comorbidities, and laboratory information, was developed and utilized prospectively.

All consecutive, morbidly obese, patients with diabetes admitted to our bariatric operation unit for LSG between January 2006 and June 2010, were included in this study. Indications for LSG were severe obesity (BMI >35 kg/m^2) associated with ≥1 comorbidities or morbid obesity (BMI >40 kg/m^2). For all patients, the LSG was considered as a primary procedure with no plan for a secondary stage. From a total of 355 bariatric patients operated during this period, 52 (14.6%) had a diagnosis of T2D before undergoing LSG. T2D diagnosis was defined when patients were being treated with oral antiglycemic therapy and/or insulin.

All patients underwent standard preoperative evaluation by a multidisciplinary team 4 to 8 months prior to the LSG and signed a written informed consent. Blood tests were performed in order to measure the level of glycated hemoglobin (A1C) and to evaluate the efficacy of pharmacologic treatment.

Primary outcome was the efficacy on T2D, by recording HbA1c levels at 1 and 5 years after LSG and comparing these values to preoperative data. Secondary outcomes included operative complications and percentage of excess weight loss (%EWL).

Complete remission of T2D was defined as a A1C value of ≤5.6% and partial remission as an A1C value of ≤6.5%[12] for both without the use of hypoglycemic oral medication or insulin. Additionally, prolonged remission was defined when these conditions were present for at least 5 years. For those who did not achieve remission, improvement of diabetes was defined as the use of less medication (ie, ≤1 less antidiabetic medication) with A1C of <7% or the use of the same preoperative medication associated with a decrease in A1C level. To meet the criteria for "improved" using only the medication data, the laboratory values had to be no worse than the preoperative levels. We used the following definitions for comorbidities: hypertension (systolic blood pressure ≥140 and/or diastolic blood pressure ≥90 mm Hg, or antihypertensive drug therapy), obstructive sleep apnea (repeated upper airway occlusions during sleep with or without sleepiness and high apnea/hypopnea index and need for continuous positive airway pressure during sleep). The criteria for remission included medication and laboratory data, but the criteria for improvement included medication or laboratory data.

Operative technique. All operations were performed laparoscopically under general anesthesia using the French position (the surgeon standing between the patient's legs). Each procedure required 5 trocars. Pneumoperitoneum was established by an open trocar insertion at the umbilicus (Hasson technique) and maintained at a pressure of 15 mm Hg. Dissection began on the greater curvature, 6 cm from the pylorus. The gastrocolic ligament along the greater curvature of the stomach was opened using an impedance coagulator Ultracision (Ethicon Endo-surgery, Johnson & Johnson Inc, Cincinnati, OH) and was freed as far as the cardio esophageal junction at the root of the left pillar of the hiatus. The short gastric vessels close to the spleen were carefully coagulated