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Original article

The long-term impact of biliopancreatic diversion on glycemic control in the severely obese with type 2 diabetes mellitus in relation to preoperative duration of diabetes

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Abstract

Background: Bariatric surgery has been shown to be effective in severely obese patients with type 2 diabetes mellitus (T2DM).

Objective: Evaluate the long-term efficacy of biliopancreatic diversion (BPD) for the treatment of T2DM depending on the preoperative duration of T2DM.

Setting: University Hospital.

Methods: Retrospective analysis investigating 2 subsets of severely obese patients who had undergone BPD from 1984 to 1995. The first included 52 patients with a preoperative T2DM duration of ~1 year (SD group – 49 on oral agents and 3 on insulin), and the second included 68 patients who had been diabetic for > 5 years before BPD (LD group – 52 on oral agents and 16 on insulin). Postoperatively, T2DM was regarded as in remission when fasting serum glucose (FSG) was lower than 100 mg/dL on regular diet and without antidiabetic therapy.

Results: In the SD patients, the number of individuals without T2DM remission were lower both at 5–10 (0/31, 0% of patients, versus 8/54, 15% of patients, $p < .04$) and at > 15 years (1/28, 3% of patients, versus 10/41, 24% of patients, $p < .0012$). Furthermore, after BPD, the number of patients with dyslipidemia strongly reduced ($p < .001$) in both groups, values at 5–10 years remaining very similar to those observed at > 15 years.

Conclusion: These results indicate that severely obese patients with longer T2DM duration have a worse metabolic outcome maintained at long and very long term following BPD. (Surg Obes Relat Dis 2015;▮:00–00.) © 2015 Published by Elsevier Inc. on behalf of American Society for Metabolic and Bariatric Surgery.

Keywords: Type 2 diabetes; Bariatric surgery; Biliopancreatic diversion; Diabetes resolution; Retrospective study; Very long term results

Introduction

In recent years, strong evidence of remission or sharp improvement of diabetic status in obese type 2 diabetics after all types of bariatric surgery has emerged [1–3]. The metabolic outcome seems to be substantially related to the extent of weight reduction, the best results being observed following the surgeries that induce consistent loss of body mass: after adjustable gastric banding, only a 20–30% of type 2 diabetes patients succeed in normalizing or reducing fasting serum glucose level; after laparoscopic Roux-en-Y gastric bypass (LRYGBP) or biliopancreatic diversion

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(BPD), a successful metabolic outcome after the surgery is observed in 60–70% and 85–95% of the operated patients, respectively, most likely from postoperative changes in enterohormonal pattern [4–8]. Nevertheless, few data are available to evaluate the metabolic results' stability over a very long term [9].

The purpose of this retrospective analysis is to ascertain the maintenance of a normal metabolic state at very long term in severely obese patients and the role of preoperative diabetes duration in the long term diabetes remission following BPD.

Material and methods

The analysis was carried out in the vast cohort of severely obese patients with type 2 diabetes having consecutively undergone BPD at the Surgical Department of Genoa University, Italy, from May 1984 to May 1999 [10]. Patients were considered to have type 2 diabetes when fasting serum glucose concentration (FSG) was higher than 125 mg/dL either before or during their preoperative evaluation and/or if they were on chronic use of antidiabetic therapy. Among this cohort, 2 groups of patients were selected; the first included 52 obese patients (30 female, aging 31–61 years) with a preoperative diabetes duration of ~1 year (mean 13.2 ± 1.1 months, SD group) and the second was composed of 68 individuals (46 female, aging 28–59 years) with a preoperative T2DM duration of >5 years (mean 6.3 ± 2.8 years, LD group). The duration of diabetes was determined at the time of the preoperative assessment. Within the SD group, 3 patients were on insulin and 49 on oral agents presurgery; within the LD group, 16 patients were on insulin and 52 on oral agents presurgery. The demographic, preoperative anthropometric, and clinical data of the patients are referred to in Table 1.

The patients underwent the ad hoc stomach type of BPD, where the gastric volume, which is the main determinant of the initial weight loss, is adapted to the preoperative excess weight and to other individual characteristics, such as sex, age, eating habits, socioeconomic status, and expected degree of compliance [10]. Patients were evaluated before the surgery and after 1, 2, and 3 years with routine follow-up visits. The majority of the patients came to an additional visit at 5–10 years following the surgery mean (8.5 ± 1.3 years). The analysis was carried out on the individual chart of any surgical patient.

The data at >15 years (mean 16.4 ± 5 years) was obtained by requesting a further follow-up visit and/or blood exams. For this analysis, the preoperative data recorded at 5–10 years and at >15 years following BPD were considered. At the 5–10 year and at the >15-year evaluation, serum glucose value was available in 65% and 57% of cases, respectively, and serum triglyceride and high density lipoprotein (HDL) cholesterol (total and HDL) levels in 56% and 36% of cases. After BPD, type 2 diabetes was regarded as resolved when serum glucose level was lower than 100 mg/dL on regular diet and without the use of any antidiabetic medications. Patients were considered as having dyslipidemia when triglycerides and/or total cholesterol serum concentration were higher than 150 mg/dL and 200 mg/dL, respectively, and/or HDL cholesterol lower than 40 mg/dL [11]. For this type of study, formal consent is not required. Considering all patients, the follow-up rate was 70% at 5–10 years and 66% at >15 years (Table 1).

Data is given as means ± SDs. The differences between continuous data were analyzed with the Student's t-test for paired and unpaired comparisons when appropriate, and the differences between categorical variables were analyzed with the Fisher's exact test. For calculation, StatView release 5.0.1, SAS Inc., Carey, NC, was used.

Results

In both the SD and LD group, at 5–10 years following the surgery, a sharp and significant reduction of both body weight (BW) and body mass index (BMI) were found.

Table 1
Severely obese patients with type 2 diabetes: anthropometric and clinical data in patients with short-term (ST) and long-term (LT) diabetes duration.

	(ST) Diabetes duration ~1 year			(LT) Diabetes duration >5 yrs		
	prior BPD	at 5–10 yrs	at >15 yrs	prior BPD	at 5–10 yrs	at >15 yrs
diabetes duration (yrs)	~1 year	-		7.1 ± 3.3		
Observed patients (#)	52	31	28	68	54	51
Insulin therapy (#, %)	3 (6%)			16 (24%)		
Weight (kg)	133 ± 21	86.7 ± 14.7*	87 ± 18*	127 ± 23	83.1 ± 17.3*	84 ± 20*
BMI (kg/m^2)	49.0 ± 7.7	31.3 ± 8.2*	33.1 ± 6.9*	48.2 ± 8.4	32.1 ± 6.1*	32.4 ± 7.5*
Percent weight loss (%)		66 ± 12	67 ± 12		67 ± 12	67 ± 11
Fasting serum glucose (mg/dL)	182 ± 52	84 ± 11*	85 ± 20*	206 ± 77	93 ± 27*§	99 ± 39*§
Serum triglycerides (mg/dL)	287 ± 229	77 ± 38*	91 ± 37*	236 ± 255	99 ± 37*	100 ± 53*
Total cholesterol (mg/dL)	215 ± 47	117 ± 68*	129 ± 28*	249 ± 32	132 ± 33*	139 ± 42*
Serum HDL cholesterol (mg/dL)	36.8 ± 13.1	45.4 ± 12.4*	45.3 ± 14.1*	36.7 ± 9.3	45.3 ± 17.2	41.7 ± 9.9*

BMI, Body mass index; HDL, high density lipoprotein; BPD, biliopancreatic diversion.
*= $p < .01$ versus before BPD.
§= $p < .01$ versus ST.