

# COMPARISON OF DIABETES CONTROL ONE YEAR AFTER GASTRIC BYPASS AND MAGENSTRASSE AND MILL PROCEDURES

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## Introduction

Bariatric surgery has become a valid long-term treatment for obesity. It also permits a rapid improvement of obesity related comorbidities like diabetes. Today, bariatric surgery has become a main therapy of type 2 diabetes in the obese population. [1] The bariatric procedures can essentially be divided into malabsorptive and restrictive procedures. Roux-en-Y Gastric Bypass (RYGB) has become the reference malabsorptive procedure.

The Magenstrasse and Mill procedure (M&M) is a purely restrictive procedure first described by Johnston and al. in 1987. It consists of an incomplete vertical gastropasty starting from the antral mill to the angle of His (fig.1) [2]

The aim of this study was to compare RYGB and M&M in terms of diabetes control at 1 year of follow-up.

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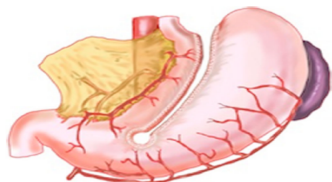


Fig. 1 The Magenstrasse and Mill procedure

## Materials and methods

We compared retrospectively 32 diabetic patients who underwent M&M during 2012 and 2013 to 121 diabetic patients who underwent RYGB during 2009 and 2013. For all patients we had complete pre- and 1-year postoperative follow-up. Grazer or sweet eaters were excluded.

M&M and RYGB groups were similar preoperatively in terms of gender (20M vs. 55M), age (53.2 vs. 49.8), weight (126kg vs. 120kg), BMI (42.6kg/m<sup>2</sup> vs. 42.5kg/m<sup>2</sup>), HbA1c (7.8% vs. 7.41%) and oral antidiabetic drugs (ADO) treatment (0.97 vs. 1.12). A higher proportion of patients were on insulin in the M&M group (46.9% vs. 28.1%, p=0.043) with a higher dose of insulin (46U vs. 27U, p=0.041) (tab.1)

The two groups were compared in terms of weight loss, excess of body weight loss (EBWL), BMI evolution as in terms of diabetes remission (defined as a HbA1c <6%) and ADO reduction at 1 year follow-up.

Table 1. Preoperative patient characteristics

	RYGB (121 patients)	M&M (32 patients)	p-value
Sex (M/F)	55/66	20/15	0.08
Age (year)	49.8	53.2	0.1
Weight (Kg)	120	126	0.15
BMI (Kg/m <sup>2</sup> )	42.5	42.6	0.89
HbA1c (%)	7.41	7.8	0.2
OAD (number)	1.12	0.97	0.34
On insulin (%)	28	47	0.043
Insulin dose (U)	27	46	0.04

## Results

### Weight evolution:

In the RYGB group, the mean weight loss was significantly higher than in the M&M group (36.8kg ± 11.8kg vs. 29kg ± 9.4kg, p=0.002). The same significantly difference was observed between the two groups concerning BMI reduction ( -13.1kg/m<sup>2</sup> ± 3.9kg/m<sup>2</sup> vs. -9.9kg/m<sup>2</sup> ± 3.3kg/m<sup>2</sup>, p=0.0002) and EBWL (77.8% ± 22.6% vs. 60.4% ± 26.1%, p=0.0002) (tab.2)

Table 2. Weight evolution after 1 year of follow-up

	RYGB (121 patients)	M&M (32 patients)	P-value
Weight loss (Kg)	36.8 (±11.8)	29 (±9.4)	0.002
BMI loss (Kg/m <sup>2</sup> )	13.1 (±3.9)	9.9 (±3.3)	0.0002
EBWL (%)	77.8 (±22.6)	60.4 (±26.1)	0.0002

### Diabetes remission:

The HbA1c reductions in the RYGB group and in the M&M group were both significant after 1 year of follow-up (-1.6% ± 1.5% vs. -1.4% ± 1.4%). But there was no difference between the two groups (p=0.79). The diabetes remission rate was similar in the two groups (42% vs. 41%, p=0.91)

We observed a significant reduction in ADO treatment in the RYGB group (from 1.12 to 0.41 p<0.0001) and in the M&M group (from 0.97 to 0.52 p<0.008). There was no difference between the two groups (p>0.05). The same results were observed if we compared in both groups only the patients who had no insulin therapy (from 1.22 to 0.35 p<0.001 for RYGB vs. from 1.24 to 0.38 p<0.0005).

Insulin therapy could be stopped in 20/34 (58%) patients in the RYGB group and in 8/15 (53%) patients in the M&M group. There was no difference between the two groups (p=0.31). But there was a significant reduction in insulin doses in the M&M group (-38.6U vs. -23.3U p=0.032) (tab.3)

Table 3. Diabetes evolution after 1 year of follow-up

	RYGB (121 patients)	M&M (32 patients)	P-value
HbA1c loss (%)	1.6 (±1.5)	1.4 (±1.4)	0.79
Diabetes remission rate (%): HbA1c <6%	42	41	0.91
AOD reduction (number)	0.71	0.45	>0.05
Insulin therapy discontinuation (%)	58	53	0.31
Insulin dose decrease (U)	23.3	38.6	0.032

## Discussion

M&M procedure is a more "physiological" restrictive procedure. Its main advantages compared to Sleeve gastrectomy or RYGB are the reversibility of the procedure, the preservation of acid and B12 intrinsic factor production, and the preservation of the antral motricity.

With a EBWL >60% after 1 year obtained by M&M procedure that is similar to these of other bariatric surgery, M&M can become a first choice technique in the treatment of obesity and associated comorbidities. (fig.2) [3]

Weight Loss after Laparoscopic M&M

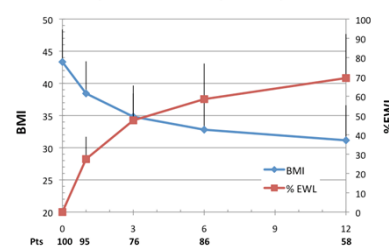


Fig.2 De Roover et al. Laparoscopic Magenstrasse and Mill Gastroplasty. First Results of a Prospective Study. *Obes Surg*

In our study, there were significantly more diabetes patients on insulin therapy and with a higher insulin dose in the M&M group. This suggests a more advanced diabetes pathology in this group.

A negative preoperative predictive factor about a lesser EBWL is a long history of diabetes. [4]

This fact or the type of procedure could explain the lesser weight loss in the M&M group compared to the RYGB group. Despite the lower weight loss, we observed similar diabetes remission rate. This could be explained by the fact that the frequently observed remission of type 2 diabetes occurs very early, before any marked weight reduction. A hypothesis proposed to explain this early effects of bariatric surgery on diabetes is a modification in the gut hormone secretion which improves insulin resistance. [5,6]

However in the M&M procedure there is no jejunal bypass or gastric resection which are both associated with a hormonal modification. Therefore other mechanisms, maybe a nervous one due to the gastric distension or simply the food restriction, are implicated in the observed diabetes remission rate.

## Conclusions

In this retrospective study, M&M procedure achieved similar diabetes improvement than gastric bypass despite lower weight loss.

Further studies are necessary to confirm these results on longer follow-up.

1. Dixon JB, le Roux CW, Rubino F, Zimmet P. Bariatric surgery for type 2 diabetes. *Lancet* 2012; 379: 2300-11.
2. Johnston D, Dachtler J, Sue-Ling HM, et al. The Magenstrasse and Mill operation for morbid obesity. *Obes Surg* 2003; 13(1): 10-6.
3. De Roover A, Kohnen L, Deflines J, Lembo B, Goessens V, Paquot N, Lauwick S, Kaba A, Joris J, Meurisse M. Laparoscopic Magenstrasse and Mill Gastroplasty. First Results of a Prospective Study. *Obes Surg* 2015; 25 :234-41.
4. Ortega E, Morinigo R, Flores L, Moize V, Rios M, Lacy AM, Vidal J. Predictive factors of excess body weight loss 1 year after laparoscopic bariatric surgery. *Surg Endosc* 2012; 26(6):1744-50
5. Mingrone G, Castagneto-Gissey L. Mechanisms of early improvement/ resolution of type 2 diabetes after bariatric surgery. *Diab & Metabolism* 2009; 35: 518-23.
6. Carmichael AR, Johnston D, King RFGJ, Sue-Ling HM. Effects of Magenstrasse and Mill operation for obesity on plasma leptin and insulin resistance. *Diab Ob and Metabolism* 2001; 3: 99-103.