12 Effects of MGB on Obesity-Related Co-Morbidities: Lipids, Hypertension, Non-Alcoholic Fatty Liver, etc.

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The MGB results in weight loss are now well-reported, but its impact on co-morbidities is still not well-known. We will first focus on metabolic syndrome, then obstructive sleep apnea (OSA), and finish with joint pain, calcium and vitamin D data (Table 12.1).

12.1 Metabolic Syndrome

The metabolic syndrome includes dyslipidemia, glucose intolerance or type 2 diabetes (T2D) and hypertension. It must be studied in its globality, because it is responsible for a high mortality. Besides glucose [metabolic markers].

12.1.1 Type 2 Diabetes

In all reports on efficiency of MGB on T2D, the remission rate has been very high [1–5] (Tables 12.2, 12.3 and 12.4).

The remission rate from T2D is defined by the American Diabetes Association as glycated hemoglobin (HbA1c) <6.5% without any medication.

In a recent study, we published the outcome of 100 diabetics out of the first 1000 MGBs performed in our institution [2]. The remission rate was 85.7%, after a mean follow-up period of 26 months, without any recurrence of diabetes.

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Table 12.1 Metabolic syndrome

Three or more out of:
• Blood glucose >1 g/L or diabetic treatment
• Blood pressure
– Systolic >130 mmHg
– Diastolic >85
• Triglycerides >150 mg/dL
• HDL <40 mg/dL
• Waist (cm): Man >102 cm Woman >88 cm

Table 12.2 Evolution of the co-morbidities at 5 years [1]

	Before MGB/0AGB n = 126	60 months after MGB n = 126	p
Hypertension	48 (38%)	23 (18.5%)	<0.001
Hyperlipemia	31 (25%)	6 (5%)	<0.001
Joint pain	52 (41%)	33 (26.5)	0.014
T2DM	28 (22%)	5 (4%)	<0.001
Sleep apnea	24 (19.5%)	12 (9.5%)	0.029

Table 12.3 Resolution of co-morbidites, comparing MGB to sleeve gastrectomy [3]

	MGB		LSG	
	Preop comorbidity (%)	Remission (%)	Pre-op comorbidity (%)	Remission (%)
T2D	63 (60.4%)	92	61 (24%)	81
Hypertension	66 (58.3%)	76	56 (47.3%)	74
Hyperlipemia	65 (62.2%)	90	64 (54.3%)	72
Sleep apnea	28 (26.8%)	97	26 (22.2%)	86
GERD	5 (4.9%)	72	6 (5.5%)	33

Table 12.4 Follow-up outcome [4]

	12 months n (%)	36 months n (%)	60 months n (%)
Patients in follow-up/patients eligible for follow-up	795/838 (94.8%)	510/570 (89.4%)	201/254 (79.1%)
Weight	91.5 ± 18.5	79.1 ± 8.55	81.7 ± 23.15
BMI (kg/m^2)	31.88 ± 4.91	27.5 ± 2.12	28 ± 2.25
EWL (%)	70.12 ± 8.35	81.5 ± 4.95	77 ± 5.14
Diabetes pts. in remission/diabetes pts. in follow up	175/201 (87)	160/186 (86)	87/103 (84.4)
Hypertensive pts. healed/hypertensive pts. in follow up	172/190 (90.5)	132/155 (85.1)	84/96 (87.5)

In our series, the decrease in glycated hemoglobin level remained stable after 5 years (Fig. 12.1). At 2 years, 71/81 patients (87.6%) had complete remission, and 10 (12.3%) had improvement in their diabetes (Fig. 12.2).

On patients receiving a single treatment (n = 30), the remission rate was 93.3% (28/30) with a mean time to remission of 7 months. Patients treated with biotherapy had a remission rate of 96% (25/26) and a mean time to remission of 7.5 months. Among the patients receiving three oral hypoglycemic drugs (n = 6), the remission rate was 56.6% and the mean time to remission was 4.3 months. The results were less marked in patients treated with injectable hypoglycemic drugs. Among these 12 patients, the remission rate was 50% and the mean time to remission was 18 months.

Duration of T2D before the MGB was also a predictive factor of success: patients with diabetes for <3 years had a higher remission rate over follow-up than those with T2D for >3 years (Fig. 12.3) .

After 5 years, the indian experience [3] (Table 12.3) showed a T2D remission rate of 92%, higher than the 81% after sleeve gastrectomy (SG).

Musella [4] (Table 12.4) reported a multicentre experience in Italy showing a T2D remission rate of 85%, which was stable with time at 12, 36 and 60 months after surgery.

This efficiency seems not to be dependant on the pre-operative BMI: in 2008, Lee compared diabetic patients with BMI <35 kg/m^2 with those of BMI >35 kg/m^2 [5].

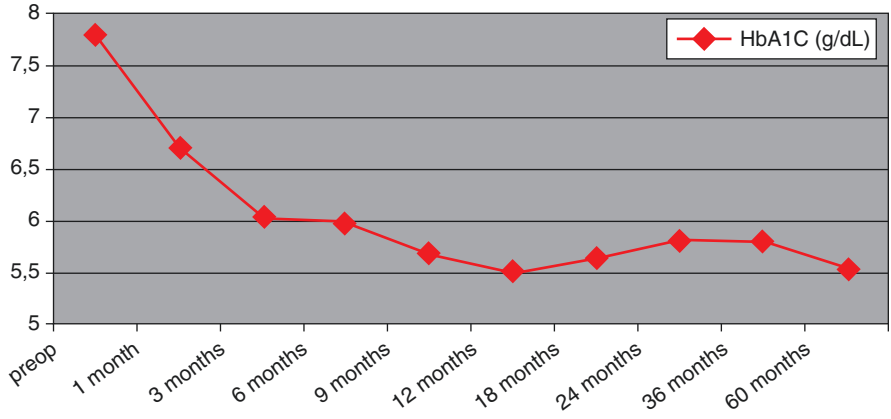

Fig. 12.1 Evolution of glycated hemoglobin (HbA1c] after MGB [2]

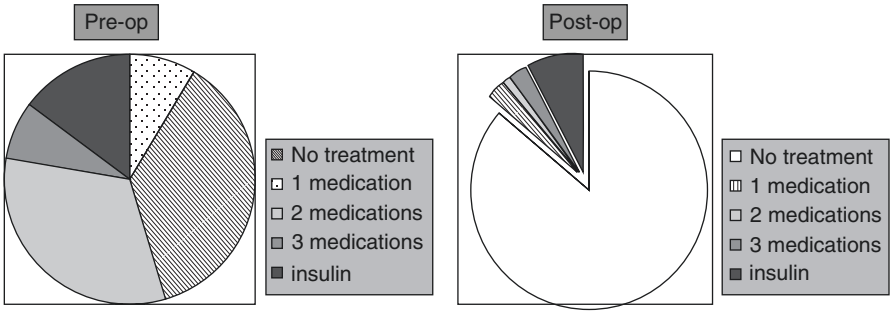

Fig. 12.2 Evolution of hypoglycemic treatment before and after MGB [2]

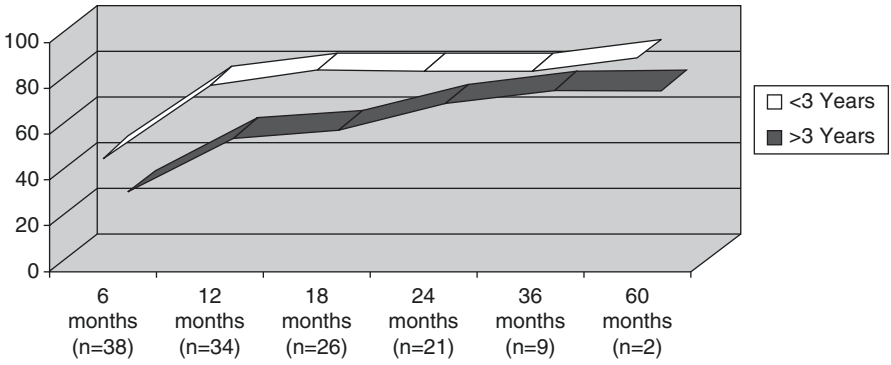

Fig. 12.3 Remission rate according to duration of diabetes [2]

Among the 201 patients who had impaired fasting glucose or T2D (out of 820 who underwent MGB from 2002 to 2006), 44 (21.9%) had BMI <35 kg/m^2, 114 (56.7%) had BMI 35–45 kg/m^2, and 43 (21.4%) had BMI >45 kg/m^2. One year after surgery, fasting plasma glucose returned to normal in 89% with BMI <35 kg/m^2 and 98.5% with BMI >35 kg/m^2 ($p = 0.087$). He concluded that MGB resulted in significant and sustained weight loss with successful treatment of T2D in 87.1%, which is similar to our results [2] (Table 12.2). Despite a slightly lower response rate in T2D after MGB, patients with BMI <35 kg/m^2 still had an acceptable T2D resolution, and this treatment can be offered to this group of patients.

A recent European survey [6] compared the efficacy of MGB and sleeve gastrectomy (SG) in T2D at 1 year of follow-up. A significant BMI decrease and T2D resolution unrelated to weight loss were recorded for both procedures. On univariate and multivariate analyses, MGB appears to outperform significantly SG. Four independent variables able to influence T2D remission at 12 months have been identified. Three were negative predictors: high baseline HbA1c, pre-operative consumption of insulin or oral antidiabetic agents, or T2D duration >10 years. MGB was a positive predictor of diabetes remission. This was also confirmed by our results [2] and the Asian experience [7].

12.1.2 Dyslipidemia

At 2 years, the resolution rate in our series was 80.6% for dyslipidemia. After 5 years, the rate of hyperlipemia decreased from 25 to 5% (Table 12.2). In India, hyperlipemia resolution rate at 5 years was 90% after MGB and 72% after SG (Table 12.3).

12.1.3 Blood Pressure

Hypertension seems to be one of the co-morbidities which is the most difficult to improve. Blood pressure remains mostly high, but the rate of hypertension decreased

Table 12.5 Comparison of clinical characteristics of patients 5 years after laparoscopic Roux-en-Y (RYGB) vs. Mini-gastric bypass (MGB) [10]

	RYGB (n = 71)	MGB (n = 277)	p-value
BMI (kg/m^2)	29.2 ± 5.3	27.7 ± 5.8	0.041*
Excess weight loss (%)	60.1 ± 20.4	72.9 ± 19.3	0.040*
Metabolic syndrome n (%)	10 (14.1)	15 (5.4)	0.012*
Albumin (g/dL)	4.5 ± 0.3	4.4 ± 0.4	0.680
WBC (10^3/μL)	6.1 ± 0.8	5.9 ± 2.3	0.949
Hemoglobin (g/dL)	12.5 ± 1.4	10.1 ± 2.8	0.006*
MCV (fL)	85.3 ± 5.5	74.9 ± 13.5	0.019*

*$p < 0.05$

from 38 to 18.5% at 5 years in our experience. Kular reported 76% remission which was equivalent to the 74% after SG (Table 12.2). The results on hypertension in Italy are even better because the resolution remained stable around 85–90% at 1, 3 and 5 years (Table 12.3).

12.1.4 Liver Metabolism/Non-Alcoholic Fatty Liver (NASH)

There is actually no study on the efficiency of MGB in non-alcoholic fatty liver disease. One can presume that MGB could at least be as efficient as RYGB on NASH [8].

The impact of MGB on hepatic markers has been recently studied [9] in non-diabetic morbidly obese patients who underwent either RYGB (n = 25) or MGB (n = 25). The MGB was a regular 200 cm bypass MGB. MGB showed a greater weight loss. Liver transaminase dropped in RYGB, while it rose in MGB. Gamma glutamyl transferase decreased significantly in RYGB over the first 3 months, while it increased in MGB. They found higher levels of triglycerides, insulin, homeostasis model assessment of insulin resistance (HOMA2-IR) and liver fat percentage in RYGB at baseline, despite matching the groups for age, sex and BMI. Those differences disappeared except for triglycerides, within 1 year.

They concluded that MGB resulted in greater weight loss but with a transitional deterioration of several liver parameters in the first post-operative year, which was not associated with weight loss.

Considering the high frequency of non-alcoholic steatohepatitis with fibrosis progression in obese patients, this must be taken into account and surveyed.

12.1.5 Comparison of MGB with RYGB

When comparing MGB to RYGB [10], a follow-up study disclosed an improvement of obesity-related clinical parameters in both groups without significant difference at 5 years after surgery (Table 12.5). The resolution rate of metabolic syndrome was >80% for both groups. Both groups had a significant decrease of hemoglobin (Hb)

Table 12.6 Comparison of the outcomes of co-morbidities after primary and revisional MGB at 5 years [12]

	Revisional MGB (n = 30)	Primary MGB (n = 96)	p
Hypertension	58% (7/12)	50% (18/36)	NS
Hyperlipemia	75% (6/8)	82% (19/23)	NS
Joint pain	33% (3/10)	38% (16/42)	NS
T2D	85% (6/7)	81% (17/21)	NS
Sleep apnea	50% (3/6)	50% (9/18)	NS

level after bypass surgery, but MGB patients had a lower level of Hb and mean corpuscular volume (MCV) than RYGB patients.

12.1.6 Obstructive Sleep Apnea (OSA)

Sleep apnea is common in morbidly obese patients. Bariatric surgery is rapidly efficient on sleep apnea, and MGB is reported to have a significant efficiency on OSA. In our experience, at 5 years the rate of obese patients who required continuous positive airway pressure treatment (CPAP) decreased from 19.5 to 9.5% (Table 12.2). In India, the resolution rate was 97%, better that the 86% after SG (Table 12.3).

12.1.7 Joint Pain, Vitamin D, Calcium

In our recent study (Table 12.2), 52 out of 126 MGB suffered from joint pain before surgery (41%); 5 years after MGB, there were only 33 out of 126 (26.5%).

The effects of MGB on vitamin D level and bone metabolism are not very well known. An Austrian team has studied a cohort of 50 patients having undergone MGB between 2011 and 2012 [11]. BMI was 45.4 kg/m^2 pre-operatively and decreased to 29.1 kg/m^2 after 12 months, corresponding to a total body weight loss of 36%. Pre-operatively the prevalence of vitamin D deficiency was 96%. They received individually adjusted vitamin D supplementation of 2000–3000 IU/day. Nevertheless, about one-third of patients remained vitamin D deficient at 12 months (80%). In patients with pre-operative BMI >45 kg/m^2, we observed a threefold higher risk for vitamin D deficiency over 12 months. Morbidly obese patients, especially those with higher pre-operative BMI, should be regularly screened pre- and post-operatively and standard post-surgical supplementation must be adequate (Table 12.6).

12.1.8 Comparison Between Primary MGB and MGB After Gastric Banding Failure (Revisional MGB)

At 5 years we did not find any significant difference in the improvement on co-morbidities whether the MGB has been done primarily or after a gastric band

failure [12]. The difference was in the quality of life: according to the GIQLY (GI quality of life) test, primary MGB had less upper gastrointestinal symptoms than revisional MGBs.

Conclusion

MGB is efficient on obesity-related co-morbidities. The resolution of the metabolic syndrome is stable with time, with a T2D remission rate >80%, outperforming sleeve gastrectomy. Hypertension and hyperlipemia decreased between 70 and 80%. Severe OSA no longer required CPAP in >90% of the cases. Joint pain decreased also mainly, but vitamin D deficiency must be screened and supplemented. There is until now no data on the efficiency of the MGB on non-alcoholic fatty liver disease, but a recent article showed that MGB resulted in greater weight loss, with a transitional deterioration of several liver parameters in the first postoperative year, which was not associated with weight loss. In summary, MGB brings a great improvement in dangerous obesity-related co-morbidities like T2D, hyperlipemia, hypertension and joint pain, but requires continuing surveillance.

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