Multidisciplinary approach of non-responders after bariatric surgery reduces the indication for revisional surgery: a retrospective cohort study

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Abstract

Background

20–30% of patients show a lack of response after bariatric surgery (BS). These non-responders may experience insufficient weight loss or significant weight regain. Based on previous research in our center, it has been identified that before the introduction of a multidisciplinary team (MDT), 68% of the non-responders underwent revisional surgery. This study describes the effect of an MDT on treatment strategy in non-responders after BS.

Methods

this retrospective study included non-responders that were reviewed in an MDT meeting. Patients were categorized as primary non-responders (1NR) or as secondary non-responders (2NR). Outcomes assessed were: I. MDT-based treatment (conservative versus operative), II. Weight loss, III. Complications after revisional surgery.

Results

a total of 104 patients were included (n = 15 1NR, n = 89 2NR). In 73 patients, lifestyle and/or behavioral changes were indicated. Only eleven patients (13%) were re-operated in which one complication occurred. Twenty patients did not show up at their appointment with the dietician, physical therapist and/or medical psychologist and were excluded from further analysis. Conservatively treated patients lost 2.1 kg < 12 months (SD = 7.29) and 0.8 kg < 24 months (SD = 5.08). Surgically treated patients lost 12.0 kg < 12 months (SD = 4.29) and 26.3 kg < 24 months (SD = 2.75).

Conclusions

the rate of revisional surgery decreased after the introduction of an MDT. An explanation for this could be that an MDT drives more patients towards a conservative treatment since it identifies modifiable lifestyle and/or behavioral factors contributing to non-response. Incorporation of an MDT may contribute to the selection of patients who might benefit from revisional surgery.

Background

Bariatric surgery (BS) has proven to be the most effective treatment for obesity in achieving long-term weight maintenance [1–2]. Unfortunately, 20–30% of patients do not respond well after BS as they experience insufficient weight loss or significant weight regain [3–4]. Popular criteria for describing insufficient weight loss are < 50% excess weight loss (EWL), or < 20% total weight loss (TWL) 1–2 years after surgery [5]. Hereafter, insufficient weight loss is described as primary non-response (1NR) while

regaining an excessive amount of weight, after initial successful weight loss, is described as secondary non-response (2NR) [6]. The etiology for non-response can be lifestyle related but can also be found in anatomical alterations like a dilated pouch or gastroenterostomy, or gastro-gastric fistula [7–8].

Revisional BS constitutes a popular solution for non-responders. Commonly offered revisional procedures are Roux-en-Y gastric bypass (RYGB), lengthening of biliopancreatic limb, band placement, revision of the gastric pouch and/or stoma or biliopancreatic diversion/ duodenal switch (BPD/DS) [7–9]. Up to now, the efficacy and safety of these procedures remain controversial as each procedure brings along specific risks [10]. Lengthening of the biliopancreatic limb may result in severe malnutrition leading to the need for reoperations. Band placement may result in reoperation due to dysphagia and/or band migration. Revision of the pouch and/or stoma displayed unsatisfactory results with no BMI loss comparing the pre-revision and 2-year post-revision situation [11].

In 1991, the National Institutes of Health Consensus Statement advocated that a multidisciplinary team (MDT) is required to optimize bariatric patient care [12]. This resulted in the formation of dedicated teams consisting of bariatric surgeons, obesity physicians, dieticians, physical therapists and medical psychologists. The beneficial effect of MDTs on surgical outcome has extensively been described in surgical oncology [13–15]. However, the effect of an MDT in non-responders after BS is relatively poorly understood. It was Srivastava et al. who demonstrated that a multidisciplinary lifestyle intervention combined with medication could improve early weight loss in non-responders [16].

Based on previous research in our center between 2012 and 2015, it has been identified that before the introduction of an MDT, 68% of the non-responders underwent revisional surgery [9]. This study included 65 patients with weight loss failure and weight regain who were consulted by a bariatric surgeon, though consultation by a dietician and physical therapist and/or medical psychologist was not scheduled routinely. Furthermore, no joint meeting by the MDT took place. It is likely that the role of an MDT needs further expansion in the management of non-responders after BS. The aim of this study was to describe the effect of an MDT, in a bariatric tertiary referral center, on treatment strategy in non-responders after BS.

Methods

Study population

Data about non-responders was collected in our center from January 2016 till December 2018 and was retrospectively analyzed. Patients were included if they regained > 5% weight with respect to the lowest postoperative weight after RYGB or sleeve gastrectomy (SG) (nadir weight). At the moment of inclusion, > 5% regain was a commonly used cut-off point [6]. Patients with a previous history of BS such as laparoscopic adjustable gastric banding or Mason gastropasty were included as well. Patients were excluded in case of a banded gastric bypass, one anastomosis gastric bypass (OAGB) or BPD. The primary BS could have taken place in our center or elsewhere. In our center, all patients were screened for primary BS by an MDT. On top of the regular treatment, a preoperative individual treatment was given if

indicated by the MDT. Patients were categorized as primary non-response (1NR) if the patients' excess weight loss (EWL) was less than 50% 12–24 months after primary surgery; patients were categorized as secondary non-response (2NR) if the EWL exceeded the 50% EWL threshold and a regain of > 5% was reported (nadir weight). All patients were discussed in an MDT meeting. The below section describes in more detail the process and approach taken before and during the MDT assessment.

Assessment before MDT meeting

Initial assessment of the patient was done by the bariatric surgeon. Hereafter, the patient was referred to the dietician and physical therapist for assessment of nutritional habits and physical activity. The dietician focused on food intake, food choices, satiety, hunger and signs of emotional eating; the physical therapist focused on an activity habits. If indicated, consultation of a medical psychologist was offered. Gastrointestinal contrast studies and laboratory tests were only performed on indication.

MDT meeting

Once the patient had a consultation with all members of the team individually, the treatment strategy was discussed in a joint MDT meeting (weekly occurrence). These meetings included at least one member of the following fields of expertise: bariatric surgeon, nurse practitioner, dietician, physical therapist and medical psychologist; the meeting was chaired by an experienced bariatric surgeon. Notably, under certain circumstances the patient was discussed in the MDT despite that he/she was not seen by all members of the team. For example, in case of persistent lack of attendance at one of the appointments.

MDT treatment strategy

After evaluation of the patient by the team, a decision was taken whether the patient needed further lifestyle and/or behavioral intervention, or whether the patient was qualified for revisional surgery. On behalf of this study, treatment options were divided into conservative and operative treatment (Fig. 1). A conservative treatment consisted of a nutritional and/or physical intervention, summarized as "lifestyle". A nutritional intervention was indicated, for example, in case of unhealthy food choices and detrimental eating patterns. A physical intervention was indicated in case of a sedentary lifestyle with the goal to increase activity habits. A behavioral intervention was indicated when there were signs of emotional eating and problems in impulse control. If there were signs indicating an eating disorder, patients were referred to a psychiatric clinic specialized in treatment of such disorders. The indication for operative treatment was not based on the degree of non-response. The type of procedure depended on the index procedure, perioperative findings and expert opinion.

Study outcomes

Patient demographics evaluated in this study include gender, age, BMI, weight loss, previous surgical history and relevant comorbidities. Outcome parameters were MDT-based treatment categorized as conservative or operative, weight loss in a period of 24 months after MDT meeting and complications after revisional surgery. Weight loss was described as %EWL and was calculated as follows: (initial

weight – final weight) / (initial weight – ideal body weight) × 100%. Ideal body weight is based on a BMI of 25 kg/m². Initial body weight was the weight at the moment of screening. Optional, weight loss was also expressed in percent total weight loss (%TWL). %TWL was calculated as follows: ((preoperative weight – final weight) / preoperative weight) × 100%. The percent of regain was calculated as percent kg gained after reaching lowest postoperative weight.

Statistical Analyses

Descriptive statistics were computed for demographic and medical characteristics. Quantitative data are presented as mean with standard deviation or median with interquartile range; categorical data are expressed in percentages. A paired t-test was performed for comparing pre- and posttreatment weight.

Results

Description of the population

A total of 119 non-responders were assessed of which fifteen patients were excluded for having a banded gastric bypass, OAGB, gastric band or BPD. Therefore, 104 patients were included in the study. The group of 1NR consisted of 15 patients and the group of 2NR consisted of 89 patients (Table 1). In the group of 2NR, 19 patients received an individual treatment, while in the group of 1NR none of the patients received an individual treatment. Moreover, 40% of the patients with 1NR had a history of gastric banding, while only 16% had this history in the group of 2NR.

Table 1
Baseline characteristics of the study population

	Total n = 104	1NR n = 15	2NR n = 89
Gender, no. (%)	92 (88.5)	11 (73.3)	81 (91.0)
Female	12 (11.5)	4 (26.7)	8 (9.0)
Male			
Age [#] (years) ¹	44.2 ± 9.8 (27–69)	44.4 ± 10.6 (23–69)	44.2 ± 9.7 (27–66)
Preoperative comorbidities, no. (%)	20 (19.2)	2 (13.3)	18 (20.0)
Hypertension	9 (8.7)	-	9 (10.1)
Type II diabetes	5 (4.8)	1 (6.7)	4 (4.5)
Dyslipidaemia	10 (9.6)	2 (13.3)	8 (9.0)
OSAS	7 (6.7)	-	7 (7.9)
Osteoarthritis			
Comorbidities, no. (%)	18 (17.3)	1 (6.7)	17 (19.1)
Unchanged	19 (18.3)	1 (6.7)	18 (20.2)
Disappeared	4 (3.8)	1 (6.7)	3 (3.4)
Recurrence			
Preoperative individual treatment, no. (%)	19 (18.3)	-	19 (21.3)
History of bariatric surgery, no. (%)	20 (19.2)	6 (40.0)	14 (15.7)
LAGB	6 (5.8)	2 (13.3)	4 (4.5)
Mason	6 (5.8)	4 (26.7)	2 (2.2)
SG			

[#] Age at time of MDT meeting

¹ Expressed in mean ± SD (range): ² Expressed in median (IQR 25–75)

List of abbreviations: MDT = Multidisciplinary Team, OSAS = Obstructive Sleep Apnoea Syndrome, BMI = Body Mass Index, LAGB = Laparoscopic Adjustable Gastric Banding, RYGB = Roux-en-Y Gastric bypass, SG = Sleeve Gastrectomy, EWL = Excess Weight Loss, TWL = Total Weight Loss, SD = Standard Deviation, IQR = Interquartile Range.

Data presented as number (%), mean (standard deviation) or median (interquartile range)

	Total n = 104	1NR n = 15	2NR n = 89
Type of surgery, no. (%)	93 (89.4)	14 (93.3)	79 (88.8)
RYGB	11 (10.6)	1 (6.7)	10 (11.2)
SG	99 (95.2)	14 (93.3)	85 (95.5)
Laparoscopic	5 (4.8)	1 (6.7)	4 (4.5)
Laparotomy			
Complications, no. (%)	92 (88.5)	15 (100.0)	77 (86.5)
No complications	2 (1.9)	-	2 (2.2)
Clavien-Dindo grade I	3 (2.9)	-	3 (3.4)
Clavien-Dindo grade II	7 (6.7)	-	7 (7.9)
Clavien-Dindo grade III			
Interval to presentation (years) ²	4 (3–6)	5 (3–7)	4 (3–5)
Preoperative weight (kg) ¹	130.9 ± 23.5 (94–231)	135.8 ± 29.7 (102–188)	130.1 ± 22.4 (94–231)
Preoperative BMI (kg/m ²) ²	43.6 (40.8–48.4)	47.4 (36.2–53.5)	43.5 (41.1–47.9)
Maximal EWL (%) ¹	75.9 ± 24.3 (9–127)	37.7 ± 10.8 (9–48)	82.4 ± 19.4 (50–127)
Maximal TWL (%) ¹	32.6 ± 10.1 (3–52)	16.6 ± 6.6 (3–27)	35.3 ± 7.9 (19–52)
Weight regain (%) ²	20.3 (14.1–30.9)	12.4 (8.0–18.0)	22.7 (14.9–32.1)
# Age at time of MDT meeting			
¹ Expressed in mean ± SD (range): ² Expressed in median (IQR 25–75)			
List of abbreviations: MDT = Multidisciplinary Team, OSAS = Obstructive Sleep Apnoea Syndrome, BMI = Body Mass Index, LAGB = Laparoscopic Adjustable Gastric Banding, RYGB = Roux-en-Y Gastric bypass, SG = Sleeve Gastrectomy, EWL = Excess Weight Loss, TWL = Total Weight Loss, SD = Standard Deviation, IQR = Interquartile Range.			
Data presented as number (%), mean (standard deviation) or median (interquartile range)			

Description of MDT-based treatment

Prior to MDT meeting, 98% was referred to a dietician, 97% was referred to a physical therapist and 28% was referred to a medical psychologist (Table 2; Fig. 2). Twenty patients did not show up at the appointment with the dietician and/or physical therapist and/or medical psychologist. Therefore, no optimal treatment could be advised and consequently these patients were excluded from further analysis.

In total, 87% received a conservative treatment and 13% an operative treatment. When focusing on the conservative treatment, 86% received a nutritional intervention, 63% received a physical intervention and 25% received a behavioral intervention.

Table 2
Overview of MDT-based treatment in non-responders

	Total n = 104	1NR n = 15	2NR n = 89
Referred patients	102 (98.1)	15 (100.0)	87 (97.8)
Dietician	101 (97.1)	15 (100.0)	86 (96.6)
Physical therapist	29 (27.9)	6 (40.0)	23 (25.8)
Medical psychologist			
No show	20 (19.2)	3 (20.0)	17 (19.1)
	Subtotal n = 84	1NR n = 12	2NR n = 72
Operative treatment, no.	11	-	11
Alternation of the limb length	3 (27.3)	-	3 (27.3)
Revision of the gastric pouch and/or stoma	7 (63.6)	-	7 (63.6)
RYGB	2 (18.2)	-	2 (18.2)
Ring placement	1 (9.1)	-	1 (9.1)
Conservative treatment, no.	73	12	61
Nutritional intervention	63 (86.3)	53 (86.9)	10 (83.3)
Physical intervention	46 (63.0)	39 (63.9)	7 (58.3)
Behavioral intervention	18 (24.7)	14 (23.0)	4 (33.3)
Referred to psychiatric institution	4 (5.5)	2 (3.3)	2 (16.7)
Data presented as number (%)			

Effect of MDT-based treatment on weight loss outcomes

Table 3 displays the effect on weight loss within 12 months and 24 months after start of the treatment. As a result of conservative treatment, patients with 1NR lost 1.2 kg within 12 months (SD = 4.3) and 2.8 kg within 24 months (SD = 2.7). Patients with 2NR lost 2.4 kg within 12 months (SD = 7.8) and 0.4 kg within 24 months (SD = 5.4). These results did not reach significance compared to their baseline weight. Additional analysis showed that within the group of conservatively treated patients with 2NR 49% did not gain any more weight or lost weight, while 51% gained weight within 24 months. The results of the surgically treated patients with 2NR are more pronounced. On average, these patients lost 12.0 kg within

12 months (SD = 10.8) and 26.3 kg within 24 months (SD = 1.1). The weight loss within 12 and 24 months was statistically significant ($p < 0.05$).

Table 3
Effect of MDT-based treatment on weight loss outcomes in non-responders

	Weight at start of treatment (kg) mean, $\pm$ SD	Δ Weight $\leq$ 12 months			Δ Weight $\leq$ 24 months		
		n	mean kg $\pm$ SD	p value	N	mean kg $\pm$ SD	p value
Conservative treatment	106.2 $\pm$ 21.5	42	- 2.1 $\pm$ 7.3	.06	17	- 0.8 $\pm$ 5.1	.49
	128.7 $\pm$ 25.0	7		.48	3		.21
Total	101.9 $\pm$ 17.9	35	-1.2 $\pm$ 4.3	.08	14	-2.8 $\pm$ 2.7	.77
Primary non-response (1NR)			- 2.4 $\pm$ 7.8			- 0.4 $\pm$ 5.4	
Secondary non-response (2NR)							
Surgical treatment	115.6 $\pm$ 17.9	9	- 12.0 $\pm$ 10.8	.01*	2	- 26.3 $\pm$ 1.1	.02*
Secondary non-response (2NR)							
* Paired t-test: significant difference compared to the initial weight, $p < 0.05$							

The results were recalculated in %TWL. When using $\geq 15\%$ TWL as a cut-off point for successful weight loss, six patients were categorized as 1NR and 98 patients as 2NR. This gives an enlargement of the group of the 2NR without affecting weight loss outcomes (conservatively treated patients lost - 2.4 kg < 12 months SD = 7.6 and - 1.7 kg < 24 months SD = 5.4, data not shown).

Effect of MDT-based operative treatment on surgical outcomes

Eleven patients were selected for operative treatment since no major nutritional-, physical-, or behavioral changes were identified. These re-operated patients were all categorized as 2NR. The index procedure was RYGB in 9 patients and SG in 2 patients. Four different surgical procedures were performed in these patients which are described in Table 2. In detail, 2 patients with prior SG underwent conversion to RYGB; 3 patients with perioperative common limb lengths between 440-600cm underwent shortening of this common limb; 7 patients with a perioperative large pouch and/or stoma underwent resizing; 1 patient additionally received a gastric ring. Postoperative, one complication occurred in a patient with a history of gastric banding, followed by RYGB and subsequent alteration of the limb length. This patient developed, one year after alteration, an ulcerative stenosis at the gastroenterostomy treated with endoscopic dilatation.

Discussion

There is no standardized approach in the treatment of non-responders following bariatric surgery. While ongoing studies about the efficacy of revisional surgery are being reported in literature, studies about the effect of a multidisciplinary approach fall behind. To our knowledge, this report is first in describing an MDT approach for non-responders after BS. The most interesting finding is that the minority of patients (13%) underwent revisional surgery, while all other patients (87%) were considered as not eligible for surgery. Before the introduction of an MDT evaluation in our center, the rate of revisional surgery was much higher (68% versus 13%) [9]. Based on these findings, it is likely to assume that an MDT approach reduced the indication for revisional surgery. An explanation for this is that an MDT approach elicits important lifestyle and/or behavioral factors driving patients towards a conservative treatment.

When reviewing weight loss outcomes, revisional surgery was most effective in managing non-response. The nine re-operated patients achieved a weight loss of 12.0 kg (SD = 10.8), recalculated as 35.9% EWL (SD = 36.2) and 29% TWL (SD = 5.2) 24 months after surgery. This result differs from the weight loss that was found earlier in forty re-operated patients lacking an MDT approach (17.6% EWL, SD = 28.3) [9]. This difference suggests that weight loss outcomes of surgically treated non-responders have been improved due to the introduction of an MDT. One can argue that an MDT approach gives a more accurate way of selecting candidates for revisional surgery. This should however be interpreted with caution since the cohort of re-operated patients in this study was very small, different surgical procedures were performed by different surgeons leading to performance bias and the results showed high variation in weight loss outcomes.

It is noteworthy to mention that the 50% of conservatively treated patients did not gain weight and the other 50% only gained minor percentages. Therefore, the question is raised why should we offer evaluation by an MDT. Perhaps, the MDT underselected appropriate candidates for revisional surgery. Although it is difficult to conclude on this based on this study, it could be presumed that an MDT is helpful in identifying lifestyle and behavioral factors contributing to non-response. When ignoring these factors while performing surgery, patients may be at risk for surgical morbidities. For further practices, a checklist of lifestyle and behavioral factors was made when evaluating candidates for revisional surgery (Table 4).

Table 4

Checklist of factors that can be used during assessment of a patient with non-response advocating conservative and surgical treatment

Factors in favor of conservative treatment	Factors in favor of surgical treatment
Excessive dietary intake	Signs of surgical failure, e.g., pouch or stoma dilatation, gastro-gastric fistula
Inappropriate food choices	Dietary compliance
Lack of satiety	No signs of maladaptive eating habits
Constant hunger sensation	Physically active
Emotional eating	No signs of mental health disorder
Binge eating	No signs of alcohol or drug use
Sweet eating	
Grazing behavior	
Physically inactive	
Mental health disorder, e.g., depression,	
anxiety, personality disorders	
Alcohol or drug use	

The observed complication rate within this study is in line with other literature. Complication rate after pouch/anastomosis revision is estimated at 3.5% and after limb alteration 12% [10]. Revision of the gastric pouch and/or stoma was most frequently performed in this study. None of the seven patients that underwent this procedure suffered from a complication. Yet, one patient suffered from an ulcerative stenosis at the gastroenterostomy after limb length alteration, which is a frequently reported complication in literature [17].

An interesting finding in this study are the differences between primary and secondary non-responders. Previous studies did not report treatment outcomes using this classification, though it is proposed as standardized terminology [6]. This study supports this classification, since it was found that only patients with 2NR were treated surgically, indicating a different treatment strategy than patients with 1NR. A note of caution is necessary as there were significant demographic differences between the two groups. Speculatively, 1NR might be a manifestation of insufficiently treated or even untreated eating behaviors and/or psychological problems, whereas 2NR might point towards anatomical problems. This theory should be further explored to prove that different treatments strategies might be applicable for the two groups of non-responders.

This retrospective study has multiple limitations that should be mentioned. Not all patients received their primary surgery in our center and therefore information about preoperative screening and treatment could

be missed. It is questionable whether certain lifestyle and/or behavioral factors were present prior to primary surgery and if so, if the patients' adjustments met the standards used in our center. Another limitation could be the possibility that the multidisciplinary team experienced a learning curve as the multidisciplinary evaluation of non-responders was introduced in 2016 in our center. It is possible that the different members of the team experienced a change in their evaluation and treatment of non-response. Moreover, it is important to bear in mind that pharmacological therapy has not been considered in this study cohort, while it has shown beneficial results in the treatment of non-responders [18]. Finally, it should be mentioned that results regarding weight loss and complication rates are limited due to the small selected group of patients that underwent revisional surgery. Patients that failed to attend follow-up appointments (48%) and/or investigations (19%) similarly limited the results. An explanation for this lack of follow-up could be the patients' embarrassment.

Conclusions

This study demonstrated that the indication for revisional surgery decreased after the introduction of an MDT for assessment of non-responders after bariatric surgery. An MDT is helpful in identifying modifiable lifestyle and behavioral factors contributing to non-response. Incorporation of an MDT may contribute to the selection of patients who might benefit from revisional surgery and protect others from unnecessary surgical morbidity. Larger prospective studies are needed to evaluate the effectiveness of an MDT and might confirm that an MDT should be a mandatory part of the treatment of non-responders.

List Of Abbreviations

BMI, body mass index; BPD/DS, biliopancreatic diversion/ duodenal switch; BS, bariatric surgery; EWL, excess weight loss; MDT, multidisciplinary team; 1NR, primary non-response; 2NR, secondary non-response; OAGB, one anastomosis gastric bypass; RYGB, Roux-en-Y gastric bypass; SG, sleeve gastrectomy; TWL, total weight loss.

Declarations

Ethics approval of consent to participate

For this type of study formal consent was not required from all individual participants. Ethical approval has been obtained from the Medical Ethics Committee of the Máxima MC. Reference number: N19.054 (L19.065).

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Not applicable.

Authors' contributions

MR, LJ, FD and WL conceived the original study and design. MR is responsible for data collection, data recording and preparing the manuscript. MU and AL contributed to writing the manuscript. All authors have read and approved the final manuscript.

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Figures

Figure 1

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Figure 2

A caption was omitted by the authors in this version of the paper.