

Adjustable gastric banding, sleeve gastrectomy and Roux-en-Y gastric bypass by laparoscopy : long term outcomes and laparoscopic solutions in case of failure

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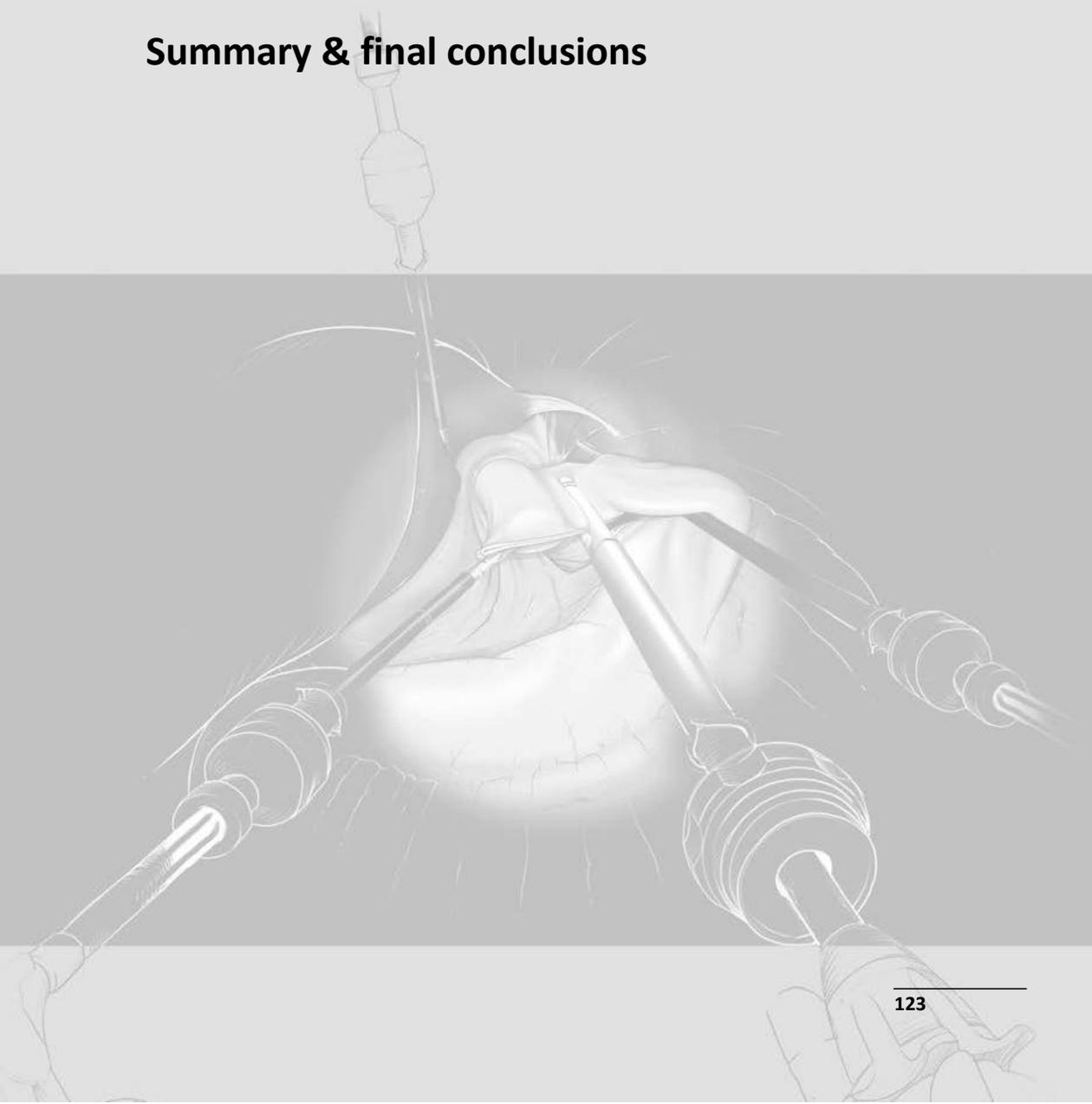
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Chapter 8.

Summary & final conclusions



8.1 SUMMARY

The advent of laparoscopy has undoubtedly triggered a tremendous increase in the number of weight loss procedures.¹ Nevertheless, the general public remains critical of such procedures. Many laypeople still consider obesity to be indicative of poor willpower and low self-esteem.²

The paradigm that every ounce of fat passes through the mouth is still very much present in today's society.³ Previously, extremely high morbidity and mortality rates may have justified the public's aversion to weight loss procedures. However, modern surgical approaches have a far better track record.^{4,5} Despite these improved results, detractors of bariatric surgery point to the significant numbers of failures, complications and reoperations that still occur after bariatric procedures. Unfortunately, most publications on the subject available today are fraught with bias and have short follow-up and incomplete data. Consequently, the conclusions drawn do not reach a high level of scientific proof.

Despite the definite drawback of being retrospective, our long-term studies are one of the first of this sort conducted. Most contemporary publications have reported on small numbers of patients and performed either short-term or cross-sectional analyses.^{6,7,8}

This study of the 3 procedures (LAGB, LSG and LRYGB) includes:

- 1/ an analysis of the weight loss results
- 2/ an analysis of long-term follow-up data including patient acceptance
- 3/ an evaluation of corrective surgical measures after failing procedures

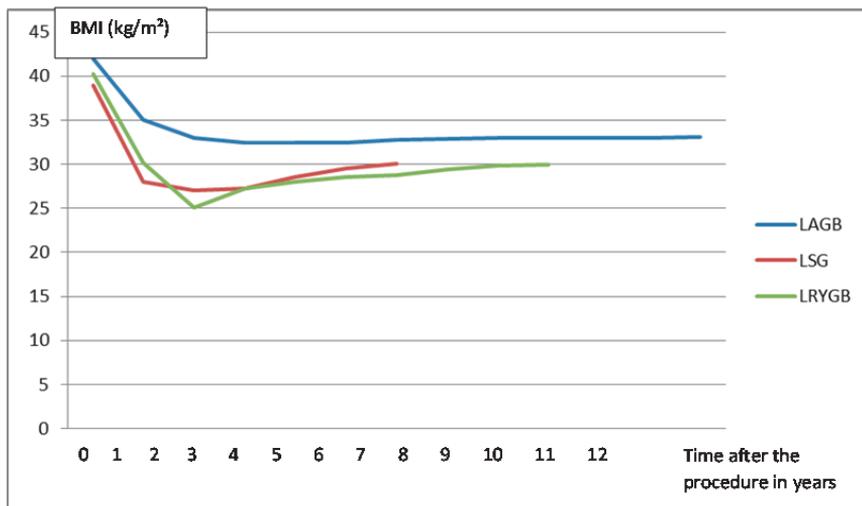
8.1.1 Weight loss results (Table 1)

According to Reinhold⁹ a weight loss procedure is successful when it induces the loss of at least 50% of the excess weight (EWL%) or when the final BMI is less than 35 kg/m². Other parameters mentioned in the literature for estimating the success of a bariatric procedure are based on the loss of excess BMI (% EBMIL) or on the final BMI and take into account the initial BMI (Biron criteria).¹⁰

Contrasting with our experience, the meta-analysis of Buchwald¹¹ focusing on all available bariatric procedures showed a marked discrepancy among the procedures, with a definite advantage to the malabsorptive over the hybrid procedures, and both aforementioned provided better results than the purely restrictive operations. That analysis, however, was based on both open and laparoscopic procedures and on relatively short-term studies. In our studies, the mean weight loss was distributed as follows: LAGB achieved an EWL of 48% after 12 years among patients who managed to keep their bands. LSG, as a sole procedure, achieved an EWL of 53.3 % after 6+ years, and LRYGB had an EBMIL (which for relatively low BMIs is comparable to EWL provided the ideal BMI is defined at 25 kg/m²) of 56.2% after 9 years.

Based on the slope of the weight (BMI) curve (Table1), our patients are likely to experience *comparable results after 12 years with any of the 3 procedures*, each resulting in approximately 50% EWL. These findings are similar to or inferior to the data in the literature.^{12,13,14}

Table 1: Progression of mean BMI per year after laparoscopic adjustable gastric band (LAGB), sleeve gastrectomy (LSG) and Roux-en-Y gastric bypass (LRYGB). (Data from chapters 4, 5 and 6.) Notice the nadir value for LSG and LRYGB. For LAGB the BMI remains relatively stable after the third year



The phenomenon of weight regain was clearly observed for both LSG and LRYGB, wherein a definite weight nadir occurred followed by regain after 2 to 3 years, respectively, for LRYGB and LSG. With LAGB, the weight loss results, although slightly inferior, appear to be sustained over time,¹⁴ but this finding only includes the patients who retained their bands (Table 1). The relatively good outcomes of LAGB, considered the least invasive bariatric procedure has led some to conclude that this technique should be the first choice in all patients, whereas the RYGB and the BPD should be considered only as remedial operations.¹⁵

Conversely, Chevallier et al.¹⁶ defined precise patient characteristics that statistically correlate with a better outcome after LAGB. These characteristics were defined based on an extensive survey conducted in France. According to this work, patients under 40 years of age, with a BMI < 50 kg/m² showed statistically significantly better results, provided they were willing to change their eating habits and to recover or increase their physical activity after surgery.

Nevertheless, it appears that, with time, only a certain number of patients continue to do well with any procedure, regardless of its type. Therefore, the main question regarding bariatric surgery may not be what type of surgery should be performed, but rather what type of patient should be chosen. One possible mecha-

nism could be a *genetic predisposition*.¹⁷ These findings support the unconfirmed hypothesis that individual carriers of a melanocortin-4 receptor gene defect suffer a higher complication rate after LAGB.¹⁸ According to this theory, it might be worthwhile in the future to genetically analyze obese patients to determine who may be a good candidate for weight loss surgery.

8.1.2 1.2. Long-Term Follow-Up

The importance of adequate follow-up after a weight loss operation cannot be overstated. One of the reasons why follow-up is so important is that the obese patient, in order to adhere to adequate dietary recommendations, needs outside assistance. This requirement may have to do with the typical personality structure of the obese individual.¹⁹

In our practice, we, similar to others,²⁰ had the tendency to be less diligent in following up with patients as the interval after surgery lengthened. Unfortunately, the assumption that patients will be conditioned to adhere to new behaviors and will be less impulsive after bariatric surgery, even years postoperatively, is not valid.²¹ Conversely, it has been difficult to detect changes in patients' dietary habits after bariatric surgery. Once counseling ends, formerly obese patients have the tendency to develop eating behaviors that are adjusted to the "new anatomical reality". Such patients learn to eat "around" their procedure²³ by eating "easier food" (figure 2) or eating more frequently (polyphagia),²⁴ all of which lead to higher caloric intake. These behaviors obviously can cause poor weight loss or even weight regain with the recurrence of obesity. The issue of follow-up can help to determine what type of procedure to choose for a particular patient. For example, LRYGB appears to be less follow-up-dependent than LAGB.²⁵ Nevertheless, each of the 3 procedures has particular features that justify rigorous follow-up. In our studies, the follow-up rates were 54.3% for LAGB after 12 years, 78% for LSG after 6+ years, and 61.1% for LRYGB after 9 years.

Laparoscopic Adjustable Gastric Banding

In the literature, there is marked inconsistency in LAGB results, ranging from extremely good²⁶ to extremely poor.²⁷

The most striking contrast is geographical. Uniformly, studies from Australia²⁸ have far better outcomes than studies from other parts of the world, particularly Europe.²⁹

The Australian studies have demonstrated that for LAGB, weight loss results are markedly dependent on the number of postoperative office visits,²⁵ and that better results are obtained with less aggressive band filling.³⁰ Frequent visits are mandatory to evaluate the patient at different time points and to adjust band filling accordingly.³¹ There is an optimal fill volume, referred to as the "green zone" (figure 1).

The green zone corresponds to the degree of intraluminal pressure that induces a sensation of satiety upon the ingestion of small but acceptably sized volumes of solid food and is not associated with dysphagia.^{32,32}

Theoretically, gastric bands interfere only with the volume of intake and not with the type of food ingested. Hence, patients just “can eat less”. This effect would imply that the need for patients to comply with dietary restrictions becomes less stringent.³⁴ Proper adjustment of the band should allow for relative immunity against dietary changes. This characteristic constitutes a significant difference compared to the other two procedures, wherein poor alimentary choices inevitably lead to weight regain. According to some, this phenomenon has not been observed with LAGB, at least when the band is still in place.³⁴

When the LAGB patient develops dysphagia secondary to an overinflated band (the so-called red zone), dilation of the pouch and/or the esophagus can occur. This dilation is pathognomonic for band overpressurization. High pressure in a spherical organ causes dilation according to Laplace’s law. Briefly, Laplace’s law states that the tension across the wall of the organ is proportional to its radius. An increase in radius (and therefore of volume) induced by overeating³⁵ once dilation is initiated will thus result in higher tension, which creates more dilation. A frequent symptom of pouch dilation is *heartburn*. While this condition should raise suspicion of pouch dilation a *de novo* hiatal hernia (HH)^{36,37} must be ruled out as well.

We found (chapter 3) that GERD was present after LAGB in less than 10% of the patients after 1 year. However, after 3 years more than 20% displayed GERD, a pattern opposite to that of patients undergoing LSG. The initial treatment consists of simply emptying the band.³⁸

An upper GI series performed *after emptying* the band differentiates GERD from band slippage or pouch dilation.³⁹ Band slippage with painful dysphagia is a surgical emergency and should be treated either by replacing the band above the dilated part or by removing the band laparoscopically⁴⁰ without delay. Conversely, in cases of simple dilation, after emptying, the band can be gradually reinflated over the course of about 6 weeks.^{41,42}

Additionally, after LAGB, endoscopy should be performed frequently during routine follow-up to document possible band erosion. Varying rates of band erosion have been reported,⁴³ ranging to as many as almost 30% of patients,⁴⁴ as we found in our series (chapter 4). Band erosion can cause pain and port infection, but, frequently, the only symptom (if any) is weight regain.⁴⁵ Despite the fact that the newer bands cause fewer erosions,^{46,47} we continue to think that most series underestimate the incidence of this complication, mostly because of the lack of symptoms. Many of our patients suffered from asymptomatic band erosion, and the diagnosis could only be made endoscopically.

Searching for hidden problems with frequent endoscopy and filling the band with the precise amount of fluid that provides restriction in the “green zone” will

require a notably strenuous follow-up regimen. Many patients require monthly office visits for years.⁴⁸

Obviously, such a regimen creates a considerable burden on the healthcare system. In Europe, the frequency of office visits is lower than in Australia.⁴⁹ One of the most often-cited causes for the low number of office visits is a lack of adequate reimbursement for follow-up filling sessions.⁵⁰

Practically speaking, even though the necessity of watching patients closely over the years is well accepted, such a painstaking regimen can be considered a major drawback of the LAGB technique within our health care system, especially given the exponential growth of the number of bariatric surgery patients. It is unknown if the Australian follow-up results can be replicated in other countries. The literature suggests that follow-up rates of greater than 50% are exceptional after 10+ years in most Western countries.^{12,50}

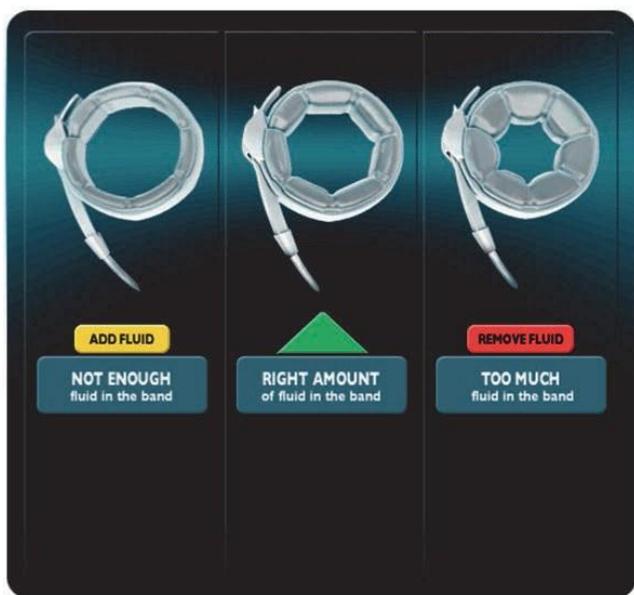


Figure 1. The yellow, green and red zones correspond to too little, adequate or too much restriction, respectively. Zones can be changed by varying the filling volume of the laparoscopic adjustable gastric band. (Source: internet shareware)

Laparoscopic Sleeve Gastrectomy

As we mentioned in chapter 5, the lack of adequate follow-up in our studies may be linked to the weight regain we observed in LSG. With LSG, weight regain appears after the 3-year mark. This phenomenon is more frequent in patients who have not returned regularly for office visits after the 3-year point.⁵¹ The number of patients with insufficient weight loss mirrors the number of patients reporting poor alimentary choices. (Figure 2)

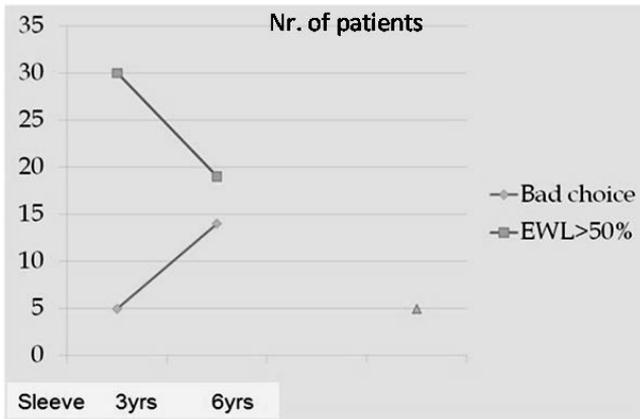


Figure 2. Negative correlation between the number of individuals with poor alimentary choices and % excess weight loss after laparoscopic sleeve gastrectomy (total number of patients = 41). (Data presented by the author at the second international consensus summit for sleeve gastrectomy, Miami, March 19-21, 2009)

Additionally, there is a striking correlation between the slope of weight regain and of new-onset GERD more than 3 years post-operation.(figure 3).We found that in most LSG patients, postoperative reflux symptoms disappeared after one year. In the longer term, however, a substantial number of patients developed new-onset GERD.

We mentioned in chapter 5 that one facilitating factor for GERD could be the regeneration of some of the fundus. This regeneration is facilitated by a relative downstream stenosis and induces a greater acid producing mucosal surface. Besides « fundus regeneration » the sleeved stomach, because of the resistance offered against a food bolus to go down, on the long term actually induces esophageal motility disturbances and increases GERD. Frequently, peristaltic waves after sleeve are comparable to contraction recordings in achalasia (Perretta S, submitted data, figure 4).



Figure 3. Progression with time of number of patients out of a total of 41 complaining of GERD and overall evolution of Body Mass Index. (Data presented by the author at the second international consensus summit for sleeve gastrectomy, Miami, March 19-21, 2009)

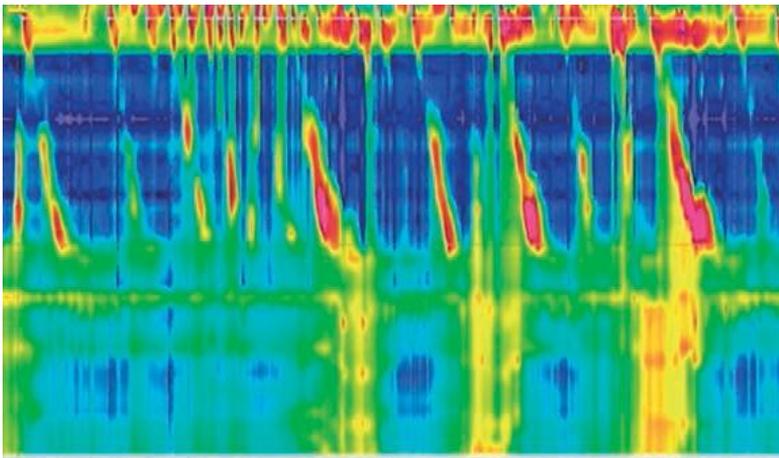


Figure 4. High Resolution Manometry in a LSG patient complaining of dysphagia and odynophagia 1 year postoperatively. Manometry recording shows irregular esophageal contractions and a migration of the Lower Esophageal Sphincter 4 cm inside the chest. (Courtesy Dr Perretta, Dr Dallemagne, Dr Marescaux, IRCAD, Strasbourg, France)

Another explanation is that, with time, certain patients start systematically to eat more than the volume capacity of the sleeved stomach. This phenomenon has been witnessed previously after VBG.⁵² The sensation of esophageal overfill is commonly attributed to reflux. Unlike acid-induced GERD, however, these symptoms typically do not occur at night, except early in the night after an oversized meal. This stasis phenomenon is also encountered with LAGB.⁵³ Typically, some relief is obtained with proton pump inhibitors, but this result does not disprove the theory of non-acid reflux.⁵⁴ After LSG, patients demonstrating *weight regain occurring with reflux*

symptoms should alarm the surgeon. These patients should be referred to aggressive alimentary counseling. Additionally, a complaint of reflux should encourage the surgeon to perform an endoscopy or upper GI series to document the reflux and to rule out apical gastric dilatation or “fundus reformation”. This is an important finding, because a repeat resection can be considered in such cases⁵⁵ only (figure 5).

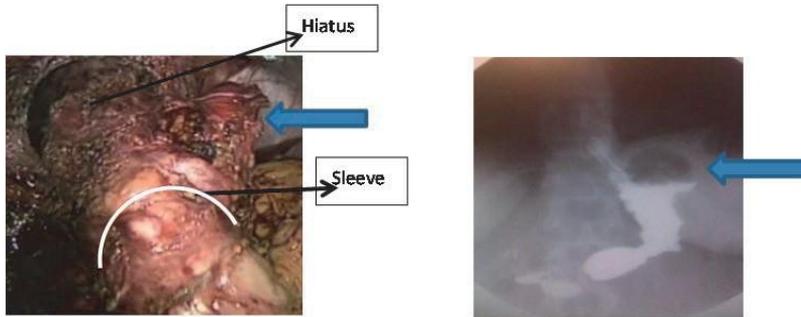


Figure 5. Apical gastric dilatation or «fundus reformation» (arrow) years after sleeve gastrectomy.

Obviously, GERD-like symptoms can only be detected when patients adhere to their follow-up routine. However, passed the 3 years mark, yearly office visits should suffice to detect GERD complaints and to act accordingly, as shown by studies of an endoscopic surveillance regimen for Barrett’s esophagus.⁵⁶ We therefore recommend a “humane” follow-up regimen beyond 3 years after LSG that consists of yearly office visits with annual endoscopy.

For the “restrictive procedures” LAGB and LSG the appearance of heartburn, generally indicative for GERD, should be considered an alarming symptom suggestive for weight regain mechanisms and thus be addressed by swift diagnostic and therapeutic action

Laparoscopic Roux-en-Y Gastric Bypass

The aforementioned restrictive component of the gastric bypass is significant for LRYGB, but other clinical factors significantly intervene. Bypassing the duodenum creates a situation in which the ingested food reaches the jejunum via a secretion-free alimentary limb without being mixed with the gastric, biliary, pancreatic and duodenal secretions. This bypassing causes a sharp increase in gastrointestinal hormones, especially GLP1, PYY and glucagon, which is followed by an “exaggerated insulin response”.⁵⁷

These hormones cause a variety of symptoms. The well known “dumping syndrome” (a form of postcibal syndrome) occurs early in the postprandial phase but we found that this condition largely disappears with time (chapter 6). Conversely,

we found that a syndrome of repeated postprandial hypoglycemia with neurological symptoms (neuroglycopenia) can occur several years after the procedure. Because these symptoms are mainly triggered by the ingestion of carbohydrates,⁵⁸ they can usually be eliminated by good dietary counseling and drastic reduction of alimentary carbohydrates. Symptoms of hypoglycemia should raise the suspicion that the patient is abusing carbohydrates, particularly sugars, which is a behavior that invariably also leads to weight (re)gain.⁵⁸ Sweets can cause weight gain because repeated hypoglycemic spells trigger a craving for more sweets, thereby stimulating the development of snacking/grazing behavior.

Therefore, follow-up after LRYGB is important to intercept dietary flaws that can cause weight gain and metabolic disturbances. Moreover, after LRYGB, office visits with blood work are needed to detect vitamin and mineral deficits that commonly occur several years after surgery.^{59,60}

For the “hybrid procedure” LRYGB the long-term appearance of symptoms of extreme fatigue, dizziness and tremor, compatible with hypoglycemia caused by dietary flaws inducing weight (re)gain, should be addressed by swift dietary and behavioral counseling.

8.1.3 Correction of poor weight loss after LAGB, LSG and LRYGB

When individuals state that they eat larger volumes (hyperphagia), the anatomical integrity of the restrictive construction may be suspect, and a surgical revision might be helpful to correct the “technical failure”. These patients have been shown to benefit from replacing or repositioning of the band⁶¹ (figure 6), repeat sleeve procedures,⁵⁵ reshaping of the pouch after bypass,⁶² revision of the GE⁶³ or combinations thereof.⁶⁴

TECHNICAL FAILURE

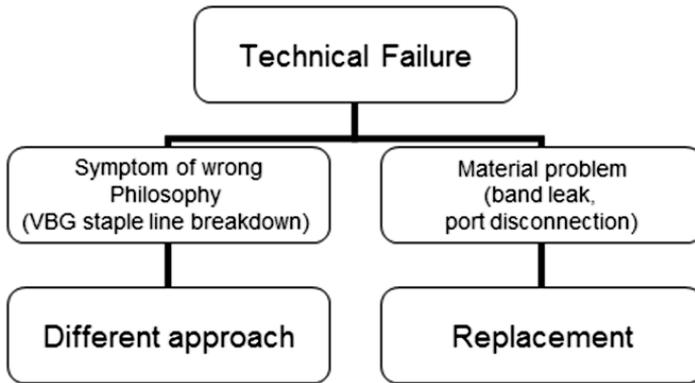


Figure 6. Example of procedural algorithm for failed bariatric procedure because of technical issues.

However, volume increase does not necessarily constitute a cause for weight regain. For instance, no definite link has been found between an increase in the volume of the alimentary limb compartment after LRYGB and weight regain.^{65,66} Also, no link has been found between expansion of the sleeved stomach after LSG and progress of the weight curve.⁶⁷

Therefore, except for patients who fail to lose weight because of obvious technical flaws [e.g., the band is too low, the fundus was left behind in an LSG (figure 5)], there is no reason to believe that a new restriction would help where the first one has failed, despite adequate execution.

Rather than reducing caloric intake by mechanical means, a better option is to achieve restriction by “central” means. Drug therapy for this goal is lacking to date, and psychotherapy remains the only other means of centrally controlling caloric intake. However, as mentioned earlier, the results of counseling are highly dependent on the adequacy of follow-up.⁶⁸ Moreover, attempts to change eating habits have a high failure rate. It is doubtful that dietary advice would be followed more closely after an operation when it was not followed previously.⁶⁹ Obese patients typically are not compliant⁷⁰ with dietary measures.

Nevertheless, because revision surgeries typically are associated with higher morbidity rates than primary procedures, repeat surgery should be performed only when counseling fails. It is beyond the scope of this work to analyze the endoscopic options for weight loss after surgery has failed. Instead, we will analyze the outcomes of the revision surgeries performed in our practice, and we will try to draw conclusions regarding an “ideal” strategy (figure 7,8).

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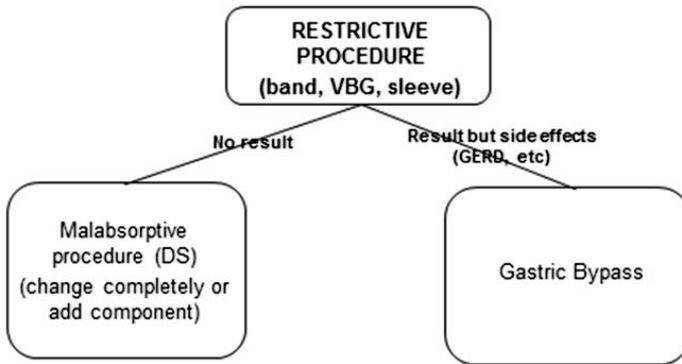


Figure 7. Procedural algorithm for failed bariatric restrictive procedure.

Laparoscopic Adjustable Gastric Banding

Failure of LAGB manifests most often by the loss of the band. In our long-term study (chapter 4), approximately 50 % of the patients had lost their band by 12 years. We have shown that after band removal, patients usually experience a sharp increase in weight if no additional measures are taken. The most commonly performed *salvage procedure after LAGB is LRYGB*.^{71,72,73}

Patients converted to LRYGB after LAGB do better in terms of weight loss. In our experience, weight loss in patients submitted to LRYGB after failed LAGB remained identical to primary gastric bypass (PGB) patients,⁷⁴ but the incidence of complications, including leaks, was significantly higher. This finding has not been observed in all series.⁷⁵ Another important condition is treatment-resistant stenosis. We mentioned this in chapter 4 and demonstrated elsewhere⁷⁴ that our stenosis rate for one-stage LRYGB after LAGB was as high as 26.3%. We most often performed band ablation and LRYGB in one stage, a strategy that, according to some, could be the cause of GE stenosis.⁷⁶ However, peroperatively the band constitutes a good landmark and provides a means of traction that is helpful in dissection. In our experience, among patients often coming from elsewhere whose bands had been lost prior to our intervention, we experienced significantly more perioperative difficulties caused by the development of a pseudo-capsule and by the usually still present gastrogastric bridge stitches, which obscure the anatomy. We feel that these factors constitute a good argument for performing the LRYGB and the band ablation in a single stage. Regardless, performing an anastomosis in previously dissected tissue takes more time and typically has higher morbidity rates,⁷⁷ even when a 2-stage strategy is elected.

For LRYGB after LAGB, the anastomosis usually will necessarily be made in the vicinity of the scar tissue created by the band to avoid having to deal with either an undersized or an oversized gastric pouch. Ill-sized gastric pouches have been implicated in poor weight loss results after RYGB.⁷⁸ Consequently, when LRYGB is chosen as a substitute procedure after LAGB, a surgical dilemma exists. Either a virtual gastric pouch (with poorly restrictive eso-enteral anastomosis) or, conversely, a large pouch must be created, at a distance from the scar tissue, which will probably result in poor weight loss. Alternatively, the anastomosis must be constructed in previously dissected territory, exposing the patient to more short- and long-term complications, including anastomotic leaks and stenosis.

Consequently, yet other options have been investigated. They include performing a BPD and leaving a large pouch after transection in healthy tissue⁷⁹ or avoiding an anastomosis altogether and performing an SG.

We have shown⁸⁰ that LSG after LAGB is feasible, and that the complication rate is acceptable. The additional weight loss, however, was modest, providing a total weight loss relative to the pre-band weight in the low 40% range. Consequently, our policy at the time became to perform a one-stage *DS in selected patients after LAGB failure*⁸⁰. Unfortunately, despite good overall outcomes and a surprisingly low complication rate, we experienced one fatality in a group of 31 patients. Since then we have only performed DS as a 3-stage procedure with a degree of lag time after LSG performed after LAGB.

For patients who do well after LAGB but display poor weight loss, another theoretical possibility is to keep the band and to construct an intestinal bypass as in DS without performing an SG. This strategy has been described by Favretti in 24 patients.⁸¹ However, in our limited and unpublished experience, this procedure caused intractable diarrhea. Abundant liquid stool after a combined LAGB and intestinal switch can be explained by a wash-out phenomenon. Scopinaro⁸² predicted that as large amounts of food gather in the normal-volume stomach beyond the obstacle of the band and reach the shortened small bowel, these amounts of food significantly override the absorption capacity of the alimentary and common limbs. Because of the combination of deceptive weight loss and intractable diarrhea we found in our patients, intestinal bypass in connection with LAGB has no place in our armamentarium of revisional bariatric procedures.

Laparoscopic Sleeve Gastrectomy

LSG has a better track record than LAGB over a 3-year span, as we have demonstrated (chapter 3). However, after more than 6 years, our positive results declined (chapter 5). Because approximately 60% of the patients did not meet the Reinhold criteria at the mid-term evaluation, a new procedure was contemplated in a substantial number of patients. Three possible approaches are possible in cases of failing LSG.

1. The first option is to repeat the gastrectomy as first described by Baltasar⁵⁵. We mentioned above that this possibility is only worth evaluating when there are clear anatomical reasons to do so. In the majority of cases, however, a new strategy should be contemplated.
2. In the literature, the most often cited revision operation is LRYGB. Schauer et al. demonstrated that in a group of 126 extremely obese patients, a majority did well with LRYGB after LSG.⁸³ Rosenthal and co-workers⁸⁴ showed that in patients complaining of GERD after LSG (which is a common finding often linked to weight regain), RYGB is a good option. RYGB is considered to be the preferred treatment for GERD after a previous restrictive bariatric procedure.⁸⁵ However, the weight loss figures for RYGB after LSG, are poorer compared with RYGB after LAGB.⁸⁶ In addition, in our experience, patients often complain of bloating after a revisional RYGB after LSG. Bloating is a common symptom after stomach surgery. In this particular case, the limited volume of the bypassed stomach can constitute a smaller than usual expansion bellows, creating uncomfortable sensations when pressure increases in the system.⁸⁷ Therefore, in patients with GERD and weight loss issues after LSG, we prefer to explore the hiatus to cure a possible hernia and to perform DS rather than LRYGB. Exploring the hiatus is however mandatory, since GERD does not evolve well after simple DS (chapter 5)
3. SG was first described as part of the DS procedure and DS can obviously be considered the logical corrective procedure for failing LSG. DS and BPD are recognized as the most effective procedures for weight loss.¹⁰ In addition, a 2-stage strategy eliminates the most dangerous consequence of one-stage DS, i.e., poor patient compliance, which can cause a life-threatening situation. The staged approach helps to exclude patients who cannot comply with dietary requirements and follow-up commitments. An additional benefit is that the remaining stomach, once fully healed after the SG, allows for sufficient volumes to be taken in, thereby eliminating the risk of protein malnutrition, which is one of the most dreaded complications after BPD.⁸⁸

Laparoscopic Roux-en-Y Gastric Bypass

For LRYGB our long-term results (chapter 6) demonstrated a few flaws that have not been highlighted previously, such as a significant number of weight loss failures. Attempts to correct this by accentuating the restrictive aspect seemed to confirm the fact that re-restriction is not the best option for poor weight loss after LRYGB. Placement of an unadjustable ring was characterized by a high erosion rate, and laparoscopic refashioning of both the pouch and the anastomosis did not provide durable results. Plication of the pouch, anastomosis and alimentary limb looked promising, but similar attempts at resection rather than plication were not conclusively effective in the experience of Gagner et al.⁸⁹ Our attempts at increasing malabsorption provided good weight loss results but at a high cost. In a group of 19

patients who underwent distalization of the bypass, we had to reconvert 2 patients for nutritional issues. This finding confirmed the data of Sugerman et al.⁹⁰ We concluded that despite good results in terms of weight loss, the *distalization* of a Roux-en-Y reconstruction should only be considered as *a last resort* (chapter 7).

Unlike in patients undergoing the other 2 procedures, revisions after LRYGB often were required for metabolic reasons. Despite the positive influence on existing type 2 Diabetes Mellitus (DM II), new onset DM II and neuroglycopenia were recorded at an alarming frequency after LRYGB. *Dietary measures* obviously are the first treatment option to resolve this issue, but as we mentioned above, changes in dietary habits are extremely difficult to achieve. Consequently, we had to undo the bypass in a number of patients and *revert them to a normal anatomy*. Restoration of normal anatomy appeared to resolve the neuroglycopenia and is certainly a more logical and less aggressive treatment than pancreatectomy⁹¹ for the treatment of this syndrome. Converting the bypass back to normal anatomy had a low morbidity rate. The long-term results were however characterized by a notably high frequency (3/8) of GERD.⁹³ Therefore, during the reversal procedure, special attention must be paid to the hiatal area. We recently started to perform a complete dissection of the crura and to approximate the crura by a posterior figure-8 stitch⁹² to correct this possible complication.

Because reversal to a normal anatomy results in weight regain in a majority of cases⁹³ we decided to submit our patients to *single-stage sleeve gastrectomy* during the conversion. This procedure could subsequently be complemented by a biliopancreatic diversion⁹⁴ in cases of insufficient weight loss. Even though we experienced one case of leakage at the staple line, there were no reoperations, as all complications could be treated conservatively. The conversion of LRYGB to normal anatomy or to LSG in one or two stages signifies a paradigm shift that opens up a variety of options (figure 8).

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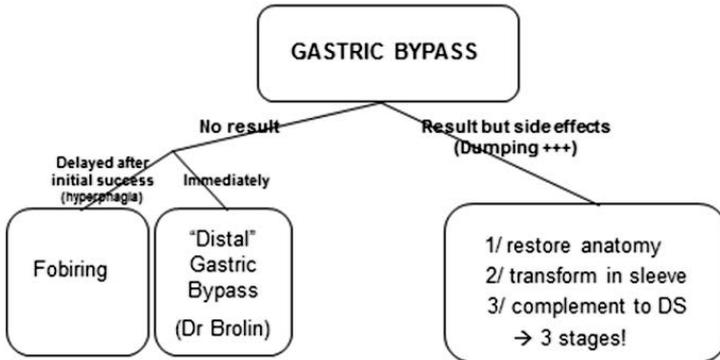


Figure 8. Procedural algorithm for failed Roux-en-Y gastric bypass

Possible revisional procedures for LAGB, LSG and LRYGB

LAGB	→Normal anatomy
	→LRYGB
	→LSG → DS
LSG	→DS
	→Re-sleeve
	→(LRYGB)
LRYGB	→Normal anatomy
	→LSG→ DS
	→Restriction (Fobi-ring, bypass)

8.1.4 Patient Satisfaction after LAGB, LSG and LRYGB

A remarkable finding in our study is that patient acceptance remains high, even in cases with modest weight loss. Patient satisfaction can be expressed in different ways. The most commonly used method is the BAROS (BariatricAnalysis and Reporting Outcome System).⁹⁵ When one analyzes patient satisfaction after open bariatric surgery, there appears to be an obvious relationship with the extent of weight loss. However, after laparoscopy, this relationship does not seem to be as marked. For example, only 40% of patients experienced good weight loss results after LAGB, yet close to 80% were happy (chapter 4). With LSG (chapter 5) and LRYGB (chapter 6),

we have found similar results. The discrepancy between laparoscopy and open surgery can be explained by several factors.

- First, open surgery is characterized by a significant number of long-term complications that are directly caused by the laparotomy. Up to 40% of the patients develop an incisional hernia, a number that is notably higher than with laparoscopy, where the incidence of incisional hernia is approximately ten times lower.⁹⁶
- Second, hospital stays are considerably shorter after laparoscopic weight loss operations.^{97,98} Consequently, patients remember the laparoscopic procedure as being easier than an open operation. There is evidence that length of hospital stay is a critical factor in the patient's subjective evaluation of the severity of an operation.⁹⁹ This factor may intervene in the lower degree of acceptance we recorded after repeat operations for failing LRYGB
- Third, with the prevalence of "social media", the feeling of belonging to a group is significantly more important than during the open surgery era. In prospective randomized studies, no significant advantage could be found for laparoscopic compared with open procedures, but laparoscopic procedures are subjectively evaluated as more modern.¹⁰⁰

Regardless of the reason, better patient acceptance is an important issue because it may indicate a lower threshold for patients to accept undergoing a second corrective procedure, if needed. Therefore, it appears that the laparoscopic approach provides psychological conditions that facilitate subsequent surgical treatment. It is noteworthy however, that patient acceptance declines rapidly in case of mishaps with the corrective procedure (chapter 7).

Patient satisfaction after laparoscopic bariatric surgery is not necessarily indicative for good clinical results. Thus, considering the link between poor weight loss and the persistence of comorbidities, corrective action may be warranted even in satisfied patients.

8.2 FINAL CONCLUSIONS

After having performed the world's first laparoscopic bariatric procedure some 20 years ago, we have by now accumulated a substantial experience with the long term outcomes of the most popular weight loss operations.

Adjustable band gastroplasty (LAGB) creates a stable weight loss of 48% at 12 years postoperatively in patients who managed to keep their band. Sleeve gastrectomy (LSG) and Roux-en-Y gastric bypass (LRYGB), are characterized by some weight re-

gain occurring after respectively 3 and 2 years postoperatively. For LSG, EWL is 53.3 % after 6 years and for LRYGB, EBML is 56.2 % after 9 years.

Failure of LAGB translates most often in removal of the band, because of erosion into the stomach or because of pouch dilation. The most frequent long-term unwanted side-effect of LSG is GERD. For LRYGB, internal hernias and late issues of glucose metabolism consisting of new-onset type 2 diabetes and neuroglycopenia are the most frequent complications.

Despite inconsistent results in terms of weight loss and despite a number of late complications, patient satisfaction remains acceptable for the 3 procedures (60.3 % for LAGB, 56.6% for LSG and 76.0% for LRYGB), most likely because in case of failure, surgical laparoscopic revision is a realistic alternative.

For LAGB, besides removal of the band, LRYGB is the most frequently chosen option in case of severe complications or unsatisfactory results. For LSG, except in cases of obvious anatomical flaws, the construction can be complemented by a DS to improve weight loss. For LRYGB, a corrective option consists of distalization, or reversal into normal anatomy, and from there, into LSG, which probably constitutes the safer option.

Our work was not able to identify one bariatric procedure of choice. However, in case of failure, traditional laparoscopic bariatric procedures can be salvaged by laparoscopic conversion

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