Maastricht University

Clinical evaluation of the surgical and endoscopic treatment of morbid obesity

Citation for published version (APA):

Schouten, R. (2011). *Clinical evaluation of the surgical and endoscopic treatment of morbid obesity*. [Doctoral Thesis, Maastricht University]. Universiteit Maastricht. https://doi.org/10.26481/dis.20110211rs

Document status and date:
Published: 01/01/2011

DOI:
10.26481/dis.20110211rs

Document Version:
Publisher's PDF, also known as Version of record

Please check the document version of this publication:

• A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
• The final author version and the galley proof are versions of the publication after peer review.
• The final published version features the final layout of the paper including the volume, issue and page numbers.

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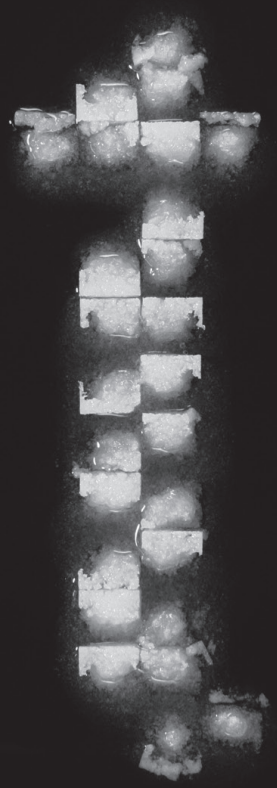
CHAPTER 5

General discussion and summary



Bariatric surgery

The main purpose of this thesis was to describe the clinical results of bariatric surgery. Traditionally, bariatric operations have been subdivided into restrictive and malabsorptive procedures. The history of bariatric surgery began with a range of malabsorptive procedures which have been either abandoned because of severe side effects or have been considerably modified [1]. Restrictive procedures have less severe side effects because the gastrointestinal tract remains intact and the digestive functionality unchanged. As a result, vitamin and mineral deficiencies are rare [2-5]. Although a wide range of procedures is available nowadays there are certainly a number of standard bariatric procedures. Laparoscopic adjustable gastric banding (LAGB) and (laparoscopic) vertical banded gastroplasty (VBG) are purely restrictive in nature while biliopancreatic diversion (BPD) and duodenal switch (DS) result in some restriction but their effect is largely based on malabsorption. The roux-en-y gastric bypass (RYGB) procedure combines a slight malabsorption with restriction while the recently popularized gastric sleeve resection (GSR) is merely a restrictive procedure. These standard bariatric procedures all have their own specific effect on the gastrointestinal tract, intestinal hormone levels and vitamin and mineral status. For example, the effect of RYGB is partially caused by the duodenal bypass effect. Excluding the duodenum from nutrients improves glucose homeostasis by itself [6]. The positive effect on weight loss by the delivery of undigested nutrients to the more distal bowel in Type 2 diabetes is another theory proven in several studies [7-9]. The gastric fundus resection in GSR plays an important role in the postoperative weight loss because of the decrease in ghrelin production [10]. Although in recent years much knowledge has been gained through intensive research, the exact working mechanisms of bariatric procedures are not yet fully understood. There is however extensive evidence that bariatric surgery does what it is designed to do. Independent of the type of procedure it results in sufficient and long term weight loss and a decrease in obesity-related comorbidities [11-13]. According to the meta-analysis of Buchwald et al., weight loss varies from a mean excess weight loss (%EWL) of 47.5% after LAGB to 70.1% after BPD and DS. Decrease in obesity-related comorbidities is in proportion with weight loss [13]. However, differences in weight loss decline in the postoperative years. After 3 years, weight loss after LAGB is 49.4% EWL compared to 62.2% EWL after RYGB, according to a meta-analysis of Garb et al. [14]. Long term results described by O'Brien et al. indicate that LAGB and RYGB have comparable results after 10 years with an EWL of 59% and 52%, respectively [15]. The same accounts for the postoperative quality of life. Improvement in quality of life

after bariatric surgery is comparable after LAGB, VBG and RYGB [16-18]. Quality of life improvement is long lasting and solely dependent on weight loss as reported by many authors [16, 17, 19-26]. This is described and confirmed in paragraph 2.2; significant correlations between weight loss and improvement of 8 of the 13 HRQoL domains were found independent of the type of procedure. Because results of weight loss, decrease in comorbidities and improvement in quality of life are comparable after the different procedures the focus in bariatric surgery should not be exclusively on these parameters. More attention should be given on the distinguishing features of the different types of operations. Important aspects are the long term complications and re-operations which are specifically addressed in the present thesis.

Results of LAGB

In chapter 2.1, the long term results of LAGB are described. An EWL of 55% after 2 years and 54% after 7 years was found with an accompanying significant decrease in obesity-related comorbidities. This is consistent with the literature findings of 56% to 62% EWL after a follow up period of at least 5 years [27-29]. However, this success is overshadowed by frequent long term complications usually leading to revisional surgery. After LAGB, 44% of patients underwent a re-operation during follow up due to band-related complications. Frequently encountered problems were pouch dilatation (21%), slippage (17%), band erosion (4%) and leakage (2%). Although the percentages of complications appear to be high they are consistent with the literature. Band erosion occurs in 0% to 14% [29-33], pouch dilatation in 8% to 24% [30, 33-35], slippage in 2% to 24% [30, 33-35] and band leakage or related tubing problems in 1% to 38% [33-35]. Because of these complications frequent re-operations are necessary after LAGB with a range in the literature of 2% to 80% [34, 36-43]. In chapter 2.1 a re-operation rate of 44% after 7 years is described. Mean time between the primary operation and the re-operation because of complications was 3 years. However, the number of re-operations is declining over the last years. Several mechanisms are responsible for the decrease in complications and re-operations. First, the surgical technique of placing the band has changed from perigastric to pars flaccida. Band slippages and pouch dilatation have decreased significantly from 29% to 4% after introduction of the pars flaccida technique in our clinic. In two randomized studies from Weiner et al. and O'Brien et al. the pars flaccida technique was demonstrated to be a safer technique with less complications, especially due to a decrease in (posterior) slippages from 16% to 4% and from 4% to 0%

[44, 45]. Second, many technical improvements have been made to the band itself like low pressure – high volume bands instead of high pressure- low volume bands resulting in a decrease in re-operation rate because of less slippages and possibly less erosions [46-49]. With use of the former, slippage rates as low as 2% have been reported after a follow up period of 2 years [50]. However, these encouraging numbers have to be brought into perspective because the third and most important reason for the reported differences in complications and re-operations after LAGB is the completeness and duration of follow up. In the literature, follow up period is highly variable with subsequent differences in re-operation rate, e.g. 3.3% after 2 years and 58% after 7 years [30, 51]. Apart from the duration the completeness of follow up is also very important. The re-operation rate in a retrospective study by Christou et al. was 16.1% after 3 years but only one third of patients were available for follow up [52]. In a case-controlled study by Cottam et al. the re-operation rate was 53% in the first year decreasing to 0% in the third year. However, follow up after 3 years was only 25% [53]. In chapter 2.1, mean time between the primary operation and the re-operation because of complications was 3 years. These results emphasize that a follow up of a reasonable patient population of 3 years and preferably 5 years is necessary for a reliable estimation of the re-operation rate.

In case of a failure after LAGB the first option is to preserve the band by performing a refixation or replacement. In the present thesis this option is described in chapter 3.2. Weight loss after laparoscopic refixation of the band was a decrease in BMI of 4.5 kg/m² after a mean follow up period of 34 months. The late re-operation rate because of complications was 5%. Results of a refixation or replacement of the band have been variable in the literature. The re-operation rate is 0% to 45% while weight results varied from a weight gain of 2.4 BMI points to a weight loss of 5.8 BMI points [54-65]. In order to compare refixation or replacement of the band with other revisional options a literature review is described in chapter 3.3. In the literature, results after conversion to RYGB in case of LAGB failure seem to be better. The re-operation rate after conversion to RYGB was 0% to 20%. Weight loss varied with a decrease in BMI between 6.1 to 13.2 kg/m² [55, 66-75]. The conversion to BPD or DS leads to more complications, especially procedure-specific nutritional problems, while weight loss is not significantly better [76-79]. Only in case of band erosion the conversion to BPD might be a feasible option because the procedure can be performed away from the eroded proximal gastric tissue. The preliminary results of conversion to GSR are encouraging [80-84] but longer follow up is necessary before this option can be considered as a feasible alternative.

In conclusion, patients with satisfying weight loss after LAGB suffering from a pure technical failure benefit from refixation or replacement of the band. For patients with poor weight loss or non-compliance a conversion to RYGB is the best option.

Results of VBG

In chapter 2.1 the long term results of VBG are described. This restrictive procedure results in an EWL of 69% after a mean follow up of 7 years. Weight loss more than 5 years after VBG varies in the literature from 30% to 59% EWL [27, 28, 85]. However, this apparent success of VBG is overshadowed by a high percentage of failures. Frequent complications necessitating a re-operation are stapler line dehiscence (51%) and anastomotic stenosis (9%). This ranges in literature from 29% to 50% [86-89] and from 14% to 40% [86-88], respectively. Because of several other long term complications like pouch dilatation and weight loss failure the percentage of re-operations after VBG is even higher. Re-operation percentages in the literature range from 10% to 79% [85, 86, 89-92] and the present thesis confirms this high failure rate (65%) after a follow up period of 7 years. Based on the literature findings and the present thesis it can be stated that VBG is a successful operation in terms of weight loss, also in a long term manner, but the failure rate is too high.

In case of failure after VBG several revisional procedures are possible. Although not investigated in the present thesis it has been indisputably proven in literature that re-doing the procedure (re-VBG) leads to poor results and a re-re-operation rate of up to 68% [86, 87, 93-96]. Therefore, a conversion to another bariatric procedure is always necessary in the case of VBG failure. Results of the conversion from VBG to LAGB have been described infrequently [97, 98] because both are purely restrictive procedures and prone to the same complications. The conversion from VBG to BPD is difficult because of the presence of a vertical stapler line but has been described in literature recently [99]. Conversion form VBG to DS also has been described in a single report [79]. Furthermore, the laparoscopic conversion from failed VBG to GSR has been reported but with poor results including a complication rate of 17% and 84% and a re-operation rate of 5% and 33% [100, 101]. In chapter 3.1, results of the conversion from VBG to RYGB are described. Follow up was 100% with a mean duration of 38 months. A low rate of perioperative complications was found (2%) but long term complications occurred in 22.7%, mainly anastomotic stenosis which could be treated by endoscopic dilatation. However, re-operations were necessary in 6.9% of cases because of renewed

weight gain. Weight loss was successful with a decrease in BMI of 10.4 kg/m² which is consistent with the literature (decrease in BMI of 8 to 11 kg/m²) [87, 88, 102-106]. The conversion to RYGB was also successful in patients with specific upper abdominal complaints which all decreased afterwards.
In conclusion, VBG is a successful operation in terms of weight loss but the failure rate is too high and it should not be performed anymore. The only evidence-based option in case of failure is conversion to RYGB which has good results on weight loss, patients' symptoms and has a low re-operation rate.

Endoscopic treatment

As a reaction to the high failure rate of restrictive procedures, the necessity of re-operations and the procedure-specific complications of malabsorptive bariatric operations many new techniques and devices are being developed. The ultimate goal is a minimally invasive technique with a low morbidity rate, no long term complications and a good and durable effect on weight and comorbidities. Apart from new laparoscopic techniques a whole variety of endoscopic procedures is now available which are described in chapter 4.1. Transoral gastroplasty is a technique where endoscopically guided staplers are placed and used to create a stapled restrictive pouch along the lesser curve of the stomach. Recently, the results of 21 patients treated with transoral gastroplasty were published by Deviere et al. Excess weight loss after this procedure was 22.6% and 24.4% after 3 and 6 months, respectively. However, 11 of 21 patients developed a stapler line failure during follow up. The most frequently reported adverse events were nausea, vomiting and pain [107]. Especially the side-effects of this technique are comparable with VBG. Therefore, the practical and widespread use of transoral gastroplasty in the future is highly questionable. Endoscopic botulinum toxin injection in the gastric antrum and fundus is another possibility and has been investigated by Foschi et al in a randomized, double-blind study. Weight loss with a decrease in BMI of 4 kg/m² was promising although follow up period was only 8 weeks. No complications occurred during the procedure and no adverse events were reported. Because of the known temporary effect of botulinum longer follow up studies are necessary to draw any conclusions about the use of this technique [108]. Another minimally invasive option is laparoscopic implantable gastric stimulation (gastric pacing) and several reports have been published with favourable results. Excess weight loss after 1 year was 23.8% to 26.6% in the studies by Favretti et al. and Bohdjalian et al. No severe postoperative

complications were reported. However, these studies included only 13 and 9 cases, respectively [109, 110]. A larger patient group is described by Miller et al. reporting 91 patients with a follow up period of 2 years. Mean excess weight loss was 25% after 1 year and 20% after 2 years [111]. However, recently published results of a randomized sham-controlled trial showed no benefit of gastric pacing after 12 months [112]. Finally, results of the endoscopically placed intragastric balloon were recently described in a review by Mathus – Vliegen et al. In randomized trials, weight loss of 16 to 21 kg was obtained after 6 months. Failure rate after balloon placement, described as no or insufficient weight loss, was 15.3% while intolerance of the balloon with removal as a consequence was reported in 6.7% [113]. In chapter 4.2, a new minimally invasive, endoscopically placed device was investigated. The duodenal-jejunal bypass sleeve (DJBS; EndoBarrier Gastrointestinal Liner, GI Dynamics, Inc, Lexington, Massachusetts, USA) is a single use endoscopic implant mimicking a duodenal-jejunal bypass. The device is comprised of a nitinol anchor, which is used to reversibly affix the device to the wall of the duodenum, and an impermeable fluoropolymer sleeve extending 60 cm into the small bowel. The anchor is located in the duodenal bulb and the sleeve stretches out into the duodenum and partially into the jejunum. As a result, pancreatic and bile juices will mix with the food only after the sleeve which may induce malabsorption and creates a bypass of the proximal intestinal tract.

Feasibility studies in animals and humans have been published. Two animal-based (porcine) studies showed a good patency of the device and acceptable tissue response while weight loss was better in treated animals compared to sham-treated animals [114]. The first 2 human studies described a safe delivery and subsequent removal of the device [115, 116]. In the present thesis the first European experience with the device is described. Thirty device patients were included and compared to 11 control patients. Four devices could not be placed because of technical problems. No severe adverse events occurred. Post-implant nausea (76.9%) and abdominal pain (50%) were the most frequently reported mild adverse events and occurred only in the first week after implantation. Four devices had to be removed early because of sleeve obstruction (1), migration (2) and unexplained abdominal pain (1). Weight loss after 12 weeks was respectively 19.0% and 6.9% for the device group and control group while 88% of patients in the device group lost more than 10% of their excess weight. Comparison of these results with the other minimally invasive techniques is difficult because of differences in weight loss parameters, follow up period and definition of failure. However, with an EWL of 19% and a failure rate of 15.3% compared to 20% - 26.6% and 15.3% - 52%, as described in the available literature of the other techniques, the device is

promising. Furthermore, because of the theoretical impact on diabetes mellitus caused by the foregut exclusion (duodenum bypass), the DJBS has gained interest not only for its potential role in weight loss but also in the treatment of T2DM. Recently, a number of studies have investigated the role of foregut exclusion in the treatment of obesity and specifically in combination with T2DM. Observational studies of RYGB patients have shown an early improvement of T2DM after the operation when weight loss was not yet achieved [117, 118]. Studies by Rubino et al. prove that bypassing a short segment of proximal intestine causes a rapid improvement of glucose homeostasis in diabetic rats, independently of food intake, body weight, malabsorption or nutrient delivery to the more distal bowel. The mechanism behind this phenomenon lies in the intestinal hormones produced in the duodenum and the proximal jejunum (foregut exclusion theory). Involved hormones are glucose-dependent insulinotropic polypeptide, which has a positive effect on insulin production and sensitivity and cholecystokinin, which influences satiety as well as insulin production [6]. Another theory is that the delivery of undigested nutrients to the more distal bowel could also cause an improvement in T2DM patients (hindgut theory) caused by elevation of the intestinal hormones produced in the ileum. These hormones, glucagon like peptide-1 and peptide YY, cause improvement of diabetes and obesity by stimulating the growth of beta cell mass and inducing satiety [7-9]. The design and position of the DJBS, with a small but specific part of excluded intestine, suggests that bypassing the duodenum is more important than the delivery of undigested nutrients to the ileum. In the study, described in chapter 4.2, 8 patients had diabetes in the device group. Improvement was observed in 6 patients and resolution in one patient. These 7 patients were able to significantly lower insulin dosages and oral medication. Mean fasting glucose levels before the device placement and after 12 weeks were, respectively, 11.1 mmol/L and 9.3 mmol/L. HbA1c levels decreased in the same period from 8.8% to 7.7%. In our opinion this is the most interesting feature of the DJBS. Because of the epidemic of T2DM, also in the non-obese population, treating therapy-resistant or severe T2DM patients with bariatric procedures is now being discussed. If the DJBS is capable of successfully treating and curing T2DM it would be preferable to a more invasive procedure. However, more research has to be performed focusing specifically on T2DM and long term results.

Conclusion

Good and durable results can be achieved with restrictive bariatric procedures although this success comes with a price. The percentage of failures and necessary re-operations after VBG is unacceptably high and therefore this procedure should not be performed anymore. In case of a failure the conversion to RYGB is a good option with excellent results on patients' weight loss, decrease in comorbidities and symptoms. Long term success can be achieved with the LAGB but a certain amount of revisional procedures will have to be taken into account. However, these re-operations in the form of refixation of the band or a conversion to RYGB are successful and have a low mortality and acceptable morbidity. A complete and durable follow up after all bariatric procedures and revisions is mandatory in order to achieve long term success. Because of the complications of the current bariatric procedures future research should focus on the development of minimally invasive but still successful techniques and devices. The DJBS is an example of a promising new technique which should be investigated more thoroughly especially because of the interesting effects on T2DM.

The future of bariatric surgery will be exciting and full of discoveries about morbid obesity and its related metabolic disorders. From around the world, medical professionals and their patients will follow the progress of bariatric surgery with great interest.

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Samenvatting

Bariatrische chirurgie

Het doel van dit promotie onderzoek is het beschrijven van de klinische resultaten van bariatrische operaties. Deze operaties worden verdeeld in twee groepen, te weten restrictieve en malabsorptieve ingrepen. Voorbeelden van puur restrictieve operaties zijn de laparoscopische aanpasbare maagband (LAMB) en de verticale maagverkleining (VMV). Daar tegenover staan de grotendeels malabsorptieve ingrepen als de biliopancreatische diversie (BPD) volgens Scopinaro en de duodenal switch (DS). Hoewel de bariatrische chirurgie is begonnen met malabsorptieve ingrepen zijn de meeste hiervan verlaten door het grote aantal complicaties [1]. Restrictieve operaties zijn minder complicatie gevoelig en veroorzaken tevens minder mineralen- en vitaminetekorten. De huidige meest toegepaste ingrepen zijn de LAMB en de (laparoscopische) maagomleiding (MO). De laatste techniek is een mengvorm van een restrictieve en malabsorptieve ingreep. Het werkingsmechanisme van de LAMB berust vooral op voedselrestrictie terwijl de LMO behalve restrictie ook een effect heeft op de hormoonhuishouding van het duodenum doordat dit orgaan wordt uitgeschakeld van de voedselstroom. Dit op zichzelf heeft een belangrijke en gunstige invloed op de glucoseregulatie bij patiënten met type 2 diabetes mellitus (T2DM) [2]. Hoewel er nog veel onduidelijk is over het werkingsmechanisme van bariatrische ingrepen is evident aangetoond dat de operaties significant en langdurig gewichtsverlies bewerkstelligen. Tevens veroorzaken de operaties een verbetering of zelfs genezing van met obesitas gerelateerde ziekten als T2DM, hart- en vaatziekten, slaap apneu syndroom, gewrichtsklachten en bepaalde soorten kanker [3, 4]. Ook de kwaliteit van leven verbetert aanzienlijk en langdurig na de operatie [5-7]. Dit effect wordt bevestigd in het huidige onderzoek en beschreven in hoofdstuk 2.2. Omdat deze verbeteringen optreden na alle operaties en de verschillen in de loop van de jaren verdwijnen is het niet alleen belangrijk om de operaties te beoordelen op deze parameters. Juist de onderscheidende factoren als lange termijn complicaties en re-operaties zouden meer aandacht moeten krijgen in toekomstig onderzoek. Dit promotie onderzoek is vooral gericht op de lange termijn resultaten, complicaties en re-operaties na de meest gebruikelijke operaties. Tevens wordt aandacht besteed aan nieuwe technieken welke minder invasief zijn en mogelijk minder complicaties veroorzaken.

Resultaten van de laparoscopische aanpasbare maagband

In hoofdstuk 2.1 worden de lange termijn resultaten van de LAMB beschreven. Het gewichtsverlies na 7 jaar is goed en vergelijkbaar met de beschreven literatuur [8-10]. Uitgedrukt in %excess weight loss (%EWL; de mate van overgewicht wat de patiënt heeft verloren) bedraagt dit 54%. Echter, dit succes gaat gepaard met vele noodzakelijke re-operaties gedurende de follow-up. Als gevolg van onder andere uitzetten van de maagpouch en “slippen” van de band moesten 44% van de patiënten opnieuw geopereerd worden na een gemiddelde periode van 3 jaar. Door een verbetering van techniek, de leercurve en betere kwaliteit van de banden daalt het aantal re-operaties de laatste jaren aanzienlijk [11, 12]. In de literatuur worden getallen van 2% re-operaties genoemd [13]. Een aantal factoren is echter zeer belangrijk bij het analyseren van deze getallen. De follow-up moet compleet en langdurig zijn om betrouwbare gegevens op te leveren. Gezien het feit dat de gemiddelde tijd tussen de eerste en de tweede operatie in deze studie 3 jaar was is een follow-up periode van minimaal 3 jaar maar bij voorkeur 5 jaar noodzakelijk om iets te kunnen zeggen over re-operaties. In hoofdstuk 2.1 wordt een follow-up van 7 jaar beschreven van 91% van de patiënten. Deze getallen kunnen derhalve als betrouwbaar worden beschouwd.

Wanneer er een complicatie optreedt na de LAMB zijn er verschillende opties. Allereerst moet getracht worden de band te behouden door deze te refixeren of eventueel te vervangen. Deze optie wordt besproken in hoofdstuk 3.2. Een laparoscopische refixatie van de band is een succesvolle ingreep aangezien de patiënten na deze re-operatie opnieuw gewicht verloren en het aantal complicaties laag was. Er moet echter wel rekening worden gehouden met de soort complicatie van de band welke de re-operatie noodzakelijk maakt. Patiënten met puur technisch falen van de band die daarvoor met de band een bevredigend gewichtsverlies hadden bereikt kunnen goed geholpen worden met een refixatie. Is er echter sprake van therapieontrouw of een onvoldoende effect van de band, dan kan er mogelijk beter worden gekozen voor het omzetten van de LAMB naar een ander soort bariatrische operatie. Deze verschillende vormen van conversie worden beschreven in hoofdstuk 3.3. Hieruit blijkt dat een refixatie van de band of een conversie naar een MO de beste opties zijn in het geval van een complicatie na een LAMB. De keuze tussen deze twee opties berust op de eerder genoemde factoren. Een conversie naar meer ingewikkelde malabsorptieve ingrepen verdient niet de voorkeur omdat het gewichtsverlies niet significant beter is en er wel meer complicaties optreden.

Concluderend is de LAMB een succesvolle operatie op de lange termijn met bevredigend gewichtsverlies. Complicaties welke een re-operatie noodzakelijk maken komen veel voor maar zijn goed te behandelen met ofwel een refixatie van de band ofwel een conversie naar een MO.

Resultaten van de verticale maagverkleining

In hoofdstuk 2.1 worden de lange termijn resultaten van de VMV beschreven. Het gewichtsverlies na 7 jaar is goed met 69% EWL en zelfs beter dan de beschreven literatuur [8, 9, 14]. Echter, dit succes gaat gepaard met een hoog faalpercentage gedurende de follow-up [15-18]. Het opnieuw uitvoeren van een VMV na een complicatie is niet succesvol en daarom dient altijd een conversie naar bijvoorbeeld een MO te worden uitgevoerd [17]. In de huidige studie was dit noodzakelijk bij 65% van de patiënten na een gemiddelde follow-up van 7 jaar. De VMV dient dan ook niet meer uitgevoerd te worden ondanks het succesvolle gewichtsverlies op de lange termijn. Het aantal complicaties en re-operaties wordt te hoog geacht.

In het geval van een complicatie na een VMV, bijvoorbeeld het loslaten van de nietjesrij of een uitgangsstenose, kan een conversie na een andere bariatrische ingreep worden overwogen. Conversies naar LAMB, BPD en DS zijn in de literatuur weinig beschreven en over het algemeen gecompliceerd [19-22]. De conversie naar een MO is de meest logische keuze en wordt beschreven in hoofdstuk 3.1. Hoewel de conversie gepaard gaat met een significant aantal complicaties (22.7%) wordt deze toch als succesvol beschouwd aangezien het gewicht verder daalt en het aantal re-operaties nadien laag is. Verder blijken de resultaten onafhankelijk te zijn van de reden van de conversie onderverdeeld in gewichtstoename, extreem gewichtsverlies of gastro-intestinale klachten.

Concluderend is de VMV op de lange termijn een succesvolle operatie qua gewichtsverlies maar dient niet meer uitgevoerd te worden omdat het aantal complicaties te hoog is. Het falen van de VMV dient bij voorkeur te worden opgelost door te converteren naar een MO.

Endoscopische behandeling

Als reactie op de lange termijn complicaties en re-operaties na restrictieve ingrepen en de procedurespecifieke problemen van de malabsorptieve ingrepen zijn er vele nieuwe technieken ontwikkeld. Idealiter is dit een minimaal invasieve techniek met weinig complicaties en een langdurig effect op gewicht en obesitas-gerelateerde ziekten. Behalve de ontwikkelingen in de laparoscopische chirurgie is er ook veel aandacht voor endoscopische technieken. Transorale gastroplastiek, endoscopische botuline injectie en maagstimulatie middels “pacing” zijn hier voorbeelden van [23-26]. In hoofdstuk 4.1 wordt een nieuwe endoscopische techniek beschreven. De duodenal-jejunal bypass sleeve (DJBS; EndoBarrier Gastrointestinal Liner, GI Dynamics, Inc, Lexington, Massachusetts, USA) is een gastroscopisch ingebrachte fluoropolymere sleeve welke wordt gefixeerd in de bulbus duodeni en over 60 cm de wand van duodenum en jejunum bedekt. Het gevolg is dat er geen contact is tussen het voedsel en de darmwand. Behalve dat dit een omleidingseffect heeft vergelijkbaar met MO is er tevens een effect op de hormoonhuishouding van het duodenum. Dit blijkt uit de snelle verbetering van T2DM na implantatie van de sleeve. In de literatuur zijn enkele dierexperimentele studies en de eerste menselijke implantaties beschreven [27-31]. In hoofdstuk 4.2 wordt de eerste Europese studie met de DJBS beschreven. Op een totaal van 30 implantaties konden er 4 niet worden uitgevoerd door technische problemen. Gedurende de follow-up werden er 4 devices verwijderd als gevolg van complicaties. Het gewichtsverlies was 19.0% EWL en dit was significant hoger dan in de controle groep welke alleen een dieet volgde (6.9%). Verder werd specifiek aandacht besteed aan de patiënten met T2DM (8 in de device groep) gezien het omleidingseffect van de DJBS. Zes patiënten merkten een verbetering op; dat wil zeggen zij hoefden minder insuline te gebruiken en hun glucose en HbA1c waardes verlaagden. Een patiënt gebruikte zelfs helemaal geen medicatie meer. Gezien het wereldwijd toenemende probleem van T2DM, vaak gepaard gaande met overgewicht, is dit mogelijk de belangrijkste eigenschap van de DJBS. Specifieke studies naar het werkingsmechanisme van de DJBS en het effect op T2DM zijn echter noodzakelijk. Deze studies worden op dit moment in onder andere onze kliniek uitgevoerd.

Conclusies

Restrictieve bariatrische ingrepen zijn succesvol op de lange termijn. Echter, het aantal complicaties en re-operaties na VMV is onacceptabel hoog. Deze operatie dient niet meer uitgevoerd te worden. Patiënten met een complicatie na een VMV zijn het beste geholpen met een conversie naar een MO. Het lange termijn succes van de LAMB gaat ook gepaard met een significant aantal re-operaties. In dit geval kan vaak worden volstaan met een refixatie van de band of een conversie naar een MO, afhankelijk van de indicatie tot re-operatie. Deze ingrepen hebben een laag complicatie percentage en zijn zeer succesvol. Derhalve is de LAMB een succesvolle bariatrische operatie en een goede eerste keuze voor morbide obese patiënten. Gezien het aantal complicaties op de lange termijn na alle ingrepen dienen alle patiënten langdurig in follow-up te blijven. Tevens zal er verder onderzoek moeten worden gedaan naar nieuwe minimaal invasieve technieken gepaard gaande met minder complicaties. De DJBS is een voorbeeld van een veelbelovende techniek met een opvallend effect op T2DM.
Bariatrische chirurgie heeft de toekomst. Als gevolg van deze operaties zal meer kennis worden vergaard over morbide obesitas en alle aan obesitas-gerelateerde ziekten. Medici en wetenschappers zullen de ontwikkelingen op dit gebied dan ook met veel interesse volgen.

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