ELSEVIER

Surgery for Obesity and Related Diseases 5 (2009) 678–683

SURGERY FOR OBESITY AND RELATED DISEASES

Original article

Laparoscopic conversion of adjustable gastric banding and vertical banded gastroplasty to duodenal switch

Giovanni Dapri, M.D.*, Guy Bernard Cadière, M.D., Ph.D., Jacques Himpens, M.D.

Department of Gastrointestinal Surgery, European School of Laparoscopic Surgery, Saint-Pierre University Hospital, Brussels, Belgium

Received April 14, 2009; revised June 16, 2009; accepted July 4, 2009

Abstract

Background: The aim of this retrospective consecutive study was to evaluate the feasibility, safety, and efficacy of the conversion of laparoscopic adjustable gastric banding (LAGB) and open vertical banded gastroplasty (VBG) into duodenal switch (DS) by laparoscopy.

Methods: From November 2003 to February 2007, laparoscopic conversion into DS was performed in 1-step in 43 patients, 31 after LAGB and 12 after VBG. The reason for conversion was weight loss issues, such as insufficient excess weight loss (EWL) or weight regain. The mean interval from LAGB and VBG to conversion to the DS was 42.7 ± 28.7 months and 172.2 ± 86.9 months, respectively. The mean %EWL at conversion was 8.3% ± 19.3% after LAGB and 20.8% ± 30% after VBG.

Results: The mean operative time was 205.8 ± 44.8 minutes for LAGB and 210.9 ± 53.7 minutes for VBG. No conversions to open surgery occurred. One patient in the LAGB group died on the third postoperative day of sudden death syndrome, as shown by the postmortem examination. Major complications occurred in 6.4% of patients with LAGB (1 hemoperitoneum and 1 ileoileostomy leak) and in 50% with VBG (1 sleeve gastrectomy leak with subsequent duodenoileostomy leak, 3 duodenoileostomy leaks, 1 pancreatitis, and 1 respiratory insufficiency). The mean hospital stay was 5.5 ± 5 days for the LAGB group and 34.5 ± 50.3 days for the VBG group. After a mean follow-up of 28 ± 15.7 months for LAGB to DS and 43.5 ± 6 months for VBG to DS, reoperations for late complications were required in 6 patients (20.6%) in the LAGB to DS group and in 5 patients (62.5%) in the VBG to DS group. Three patients (25%) died within 8 months after conversion of VBG. The 29 surviving patients (LAGB to DS) showed a mean %EWL and percentage of excess body mass index loss of (%EBMIL) 78.4% ± 24.9% and 77.8% ± 23.7%, respectively. The 8 surviving patients (VBG to DS) had a mean %EWL and %EBMIL of 85.1% ± 20% and 85.8% ± 18.7%, respectively.

Conclusion: According to these results, laparoscopic conversion of LAGB to DS seems feasible and effective, despite the 1 death. However, in our hands, laparoscopic conversion of VBG to DS had an unacceptable rate of complications and deaths. (Surg Obes Relat Dis 2009;5:678–683.)

Keywords: Gastric banding; Vertical gastroplasty; Failure; Conversion; Duodenal switch

In the past century, the most common bariatric procedures have been restrictive procedures such as vertical banded gastroplasty (VBG) and laparoscopic adjustable gastric banding (LAGB). Malabsorptive procedures such as biliopancreatic diversion or duodenal switch (DS) have been less popular than the restrictive procedures, because they are technically more difficult to perform and require close patient follow-up [1–3].

Presented as an oral presentation at the XXVIth Annual Meeting of the American Society for Metabolic and Bariatric Surgery, Grapevine, Texas, June 21–26, 2009

*Reprint requests: Giovanni Dapri, M.D., Department of Gastrointestinal Surgery, European School of Laparoscopic Surgery, Saint-Pierre University Hospital, 322, rue Haute, Brussels 1000 Belgium.

E-mail: giovanni@dapri.net

1550-7289/09/$ – see front matter
doi:10.1016/j.soard.2009.07.001

Together with the rapid increase of patients undergoing surgery for morbid obesity, revisional surgery is becoming more common. Insufficient weight loss or weight regain after previous restrictive procedures is one of the challenges often confronting bariatric surgeons [4]. In addition to weight issues, other possible indications for revisional surgery include complications. Quite often, bariatric operations have their own typical complications. After LAGB, the appearance of gastroesophageal reflux disease (GERD), gastric erosion, band dilation, and tube-port problems have been reported [5–9]. After VBG, the development of GERD, band erosion, stomal stenosis, ulceration, and staple line rupture have been reported [5,10–13].

After LAGB, in addition to simple band removal [14], different options of conversion have been described, such as conversion to laparoscopic Roux-en-Y gastric bypass (LRYGB) [14–25], laparoscopic sleeve gastrectomy (LSG) [14,26,27], or laparoscopic rebanding [14,28]. After VBG, the most frequently reported revisional surgery for whatever reason has been conversion to LRYGB [29,30].

Very few reports have described the technique and results of conversion from VBG [31–33] or LAGB [34–37] to duodenal switch (DS). The aim of the present retrospective consecutive study was to evaluate the feasibility, safety, and efficacy of laparoscopic conversion of LAGB and VBG to DS.

Methods

From November 2003 to February 2007, 1-step laparoscopic conversion to DS was performed in 43 patients who had previously benefited from a restrictive procedure: 31 patients after LAGB (28 women and 3 men) and 12 patients after VBG (10 women and 2 men). In all patients but 2, 1 in each group, the reason for conversion to DS was weight loss issues, such as insufficient excess weight loss (EWL) or weight regain, after LAGB or VBG. Two patients with good weight loss underwent revision because of intractable GERD, persisting despite band deflation in 1 and incision of the Marlex mesh in the other. Unlike the LAGB group, all VBG patients had undergone laparotomy, and Marlex mesh had been used to reinforce the pouch outlet.

The average interval between LAGB and VBG to conversion to DS was 42.7 ± 28.7 months (range 9–137) and 172.2 ± 86.9 months (range 46–261), respectively.

At LAGB, the mean body mass index (BMI) was 45.4 ± 6.3 kg/m^2 (range 35–58). At conversion, the mean BMI, %EWL, and percentage of excess BMI loss (%EBMIL) was 43.2 ± 8.1 kg/m^2 (range 31–57), 8.3% ± 19.3% (range 27.5–67.1%), and 8.3% ± 19.9% (range −26.3–66.6), respectively. At VBG, the mean BMI was 47.8 ± 7.1 kg/m^2 (range 41–67.7). At conversion, the mean BMI, %EWL, and %EBMIL was 41.5 ± 6 kg/m^2 (range 35–51), 20.8% ± 30% (range −33.8–71.1%), and 20% ± 29.9% (range −31.5–69.3), respectively.

The average age at conversion from LAGB to DS and VBG to DS was 39.8 ± 8.5 years (range 24–57) and 47.7 ± 8.6 years (range 30–55), respectively.

At conversion, 14 patients with LAGB had obesity-related co-morbidities, including arterial hypertension in 10, type 2 diabetes in 4, degenerative joint disease in 7, and sleep apnea in 1. Eight patients with VBG had co-morbidities including arterial hypertension in 4, type 2 diabetes in 2, degenerative joint disease in 3, and sleep apnea in 2.

The statistical analysis consisted of studying the distributions of the parameters we collected using summary parameters: mean and standard deviation. No attempt was made to use performance hypothesis tests between the groups because the follow-up time in the present retrospective study was too different between the 2 groups (28 ± 15.7 months versus 43.5 ± 6 months).

Surgical technique

The patient was positioned supine with the legs apart and both arms in abduction. The surgeon stood between the patient's legs, with the camera person to the patient's right and the assistant to the patient's left. Six abdominal trocars were placed as follows: a 10-mm trocar (for the 30° optical system) 20 cm distal to the xiphoid process, a 5-mm trocar on the left anterior axillary line about 5 cm distal to the costal margin, a 12-mm trocar on the left mid-clavicular line between the first and second trocars, a 12-mm trocar on the right mid-clavicular line on the same horizontal line, a 5-mm trocar distal and to the left of the xiphoid process, and a 5-mm trocar in the lower abdomen, to the left of the linea alba. Adhesiolysis between the abdominal wall and greater omentum and small bowel was performed to reach the left upper quadrant, followed by adhesiolysis between the left liver lobe and the stomach. The right hiatal pillar was systematically searched for by lysis of the adhesions alongside the lateral border of the caudate lobe. The left hiatal pillar was also dissected by freeing the greater curve from distally to proximally. After LAGB, the gastrogastric tunnel was sectioned. After VBG, the vertical staple line was well isolated and exposed over its entire length. The proximal limit of the antrum, about 6 cm cranial to the pylorus, was superficially scored, and the greater curvature was freed from the greater omentum using the Ligasure device (Covidien, New Haven, CT) or hook cautery, until the previously liberated left crus was reached. The stomach was transected by multiple firings of a linear stapler loaded with green cartridges (Covidien), with guidance of a 34F orogastric tube, which was positioned against the lesser curve. In patients with LAGB, the band was kept in place as a landmark for the more proximal staple firings. At the end of the gastric tubulization, the band was opened and retrieved. The fibrotic perigastric capsule at the site of the band was opened. Similar to the procedure in the patients with VBG, the firing of staplers was oriented toward the vertical staple

line and the Marlex mesh. Once the Marlex mesh was reached, stapling was performed cephalad to the right of the staple line in the direction of the angle of His. Two converging seroserosal running sutures were used to buttress the staple line. Cholecystectomy was performed. The specimen, including the vertical staple line (if VBG) or the band (if LAGB), and the gallbladder were retrieved at the end of the procedure by enlarging the left upper quadrant 12-mm trocar opening. The first part of the duodenum was encircled, just laterally to the gastroduodenal artery, and sectioned with a linear stapler using a blue load.

The surgeon, camera person, and assistant moved to the patient's left. The right colon was widely freed to provide more slack to the distal ileum in view of the duodenoileostomy. The common and alimentary limbs were fashioned and measured to 100 cm and 150 cm, respectively. Precise measurements were made by stretching the bowel along a 25-cm tape. A semimechanical side-to-side ileoileostomy was performed between the alimentary and biliopancreatic limbs, with final sectioning of the alimentary loop close to this anastomosis. The mesenteric defect was closed using nonabsorbable pursestring suture. The alimentary limb was advanced in direction of the sectioned duodenum. The surgeon returned to between the patient's legs, the camera person to the patient's right, and the assistant to the patient's left. The duodenoileostomy was performed by manually suturing 1 layer of running suture of absorbable material. Petersen's defect was closed by nonabsorbable pursestring suture. The orogastric tube was advanced distally by the anesthesiologist until it reached the pylorus. A leak test was performed by air insufflation, keeping the duodenoileostomy under water. The specimens were retrieved and the enlarged left 12-mm port site was closed in layers. The subcutaneous port was removed in the LAGB patients. A drain was left in the vicinity of the sleeve gastrectomy and the duodenoileostomy. A methylene blue test was performed on the first postoperative day. If negative, the patient was allowed to start a liquid diet on the second postoperative day. Typically, the patient was discharged from the hospital on the fifth postoperative day.

Results

The mean operative time was 205.8 ± 44.8 minutes (range 120–300) for the LAGB group and 210.9 ± 53.7 minutes (range 180–330) for the VBG group. No conversions to open surgery occurred. One patient after LAGB died on the third postoperative day of the sudden death syndrome as confirmed by the postmortem examination.

Major complications occurred in 2 patients in the LAGB group (6.4%). One patient presented with a hemoperitoneum that required second-look laparoscopy, and 1 patient developed a leak at the ileoileostomy, which was treated medically. After VBG, 6 patients (50%) presented with major complications: 1 gastrocutaneous leak from the sleeve gastrectomy with a subsequent leak at the duodenoileostomy, 3 solitary leaks at the duodenoileostomy, 1 hemorrhagic pancreatitis, and 1 respiratory insufficiency (Table 1). The patient presenting with a leak at the sleeve gastrectomy and duodenoileostomy was transferred to another hospital for placement of 2 endoscopic stents. Immediately after stent placement, the patient developed hemorrhagic shock. Total gastrectomy was performed by open access at the same hospital. The patient eventually died in our hospital 1 month later of multiple organ failure. Two patients with a duodenoileostomy leak were treated by laparoscopic revision and discharged after 8 and 11 days, respectively. One developed duodenoileostomy stenosis after 8 months. This stenosis was refractory to multiple endoscopic dilations and was finally treated by subtotal gastrectomy with gastroileostomy after 12 months. The third patient with a duodenoileostomy leak underwent re-exploration after 5 days and underwent conversion to subtotal gastrectomy with gastroileostomy. This patient developed a gastroileostomy leak that was treated by placement of an endoscopic stent. At 7 months, the fistula was still present and increasingly symptomatic. The patient underwent laparoscopic re-exploration, and an unsuccessful attempt was made to close the fistula. The patient died 1 month later of, what on autopsy, appeared to be an abdominal compartment syndrome. The patient with hemorrhagic pancreatitis was checked laparoscopically on the fourth postoperative day and discharged 14 days later. The patient with respiratory

Table 1
LAGB to DS and VBG to DS: early major complications

Group	Early complications	Patients (n)	Treatment	Hospital stay (d)
LAGB to DS	Hemoperitoneum	1	Laparoscopic revision	9
	Ileoileostomy leak	1	Conservative therapy	14
VBG to DS	Gastric leak and duodenoileostomy leak	1	Endoscopic stent, final total gastrectomy	149
	Duodenoileostomy leak	3	Laparoscopic revision, 2; laparoscopic subtotal gastrectomy, 1	8, 11, and 76
	Pancreatitis	1	Laparoscopic revision	14
	Respiratory insufficiency	1	Conservative therapy	15

LAGB = laparoscopic adjustable gastric banding; DS = duodenal switch; VBG = vertical banded gastroplasty.

Table 2
LAGB to DS and VBG to DS: late complications

Group	Late complications	Patients (n)	Follow-up month	Laparoscopic treatment
LAGB to DS	Hypoproteinemia, diarrhea	2	14 and 31	Bowel lengthening
	Hiatal hernia	1	16	Crura repair
	Internal hernia	3	16, 31, and 45	Repair
VBG to DS	Duodenoileostomy stenosis	1	8	Endoscopic dilation, final subtotal gastrectomy
	Internal hernia	1	23	Repair
	Hypoproteinemia, diarrhea	1	25	Bowel lengthening
	Abdominal pain	1	34	Exploration
	Hiatal hernia	1	36	Mesh crura repair

Abbreviations as in Table 1.

insufficiency was treated medically and discharged on postoperative day 15.

Minor postoperative complications occurred in 2 patients in the LAGB group, who presented with a subcutaneous abscess at the trocar site, and in 1 patient in the VBG group, who presented with an intra-abdominal abscess that was successfully treated by percutaneous computed tomography-guided drainage.

The mean hospital stay after conversion of LAGB to DS and VBG to DS was 5.5 ± 5 days (range 3–28) and 34.5 ± 50.3 days (range 4–149), respectively.

One patient from each group, both foreigners, refused our follow-up. The remaining 29 surviving patients after LAGB and 8 surviving patients after VBG were followed up with office visits and telephone calls. In the LAGB to DS group, during a mean follow-up of 28 ± 15.7 months (range 2–54), reoperations for late complications were required in 6 (20.6%) of the 29 surviving patients (Table 2). With the initial excess weight before LAGB as a reference, the mean %EWL and %EBMIL was 78.4% ± 24.9% (range 23.4–123.6%) and 77.8% ± 23.7% (range 24–126.6%), respectively (Fig. 1). In the VBG to DS group, during a mean follow-up of 43.5 ± 6 months (range 36–50), reoperations for late complications were necessary in 5 (62.5%) of 8 surviving patients (Table 2). A third patient from this group died of a pulmonary embolism, confirmed at autopsy, 2 months after the procedure, for a mortality rate in this group of 25%. With the initial excess weight before VBG as a reference, the mean %EWL and %EBMIL was 85.1% ± 20% (range 59–121.1) and 85.8% ± 18.7% (range 60.8–102), respectively (Fig. 2).

Discussion

Failure of restrictive procedures can be managed by another, nonrestrictive, operation. The decision to reoperate should be made after multidisciplinary consultation among a psychologist, nutritionist, gastroenterologist, and surgeon. The patients in the present study had all had a compulsive eating disorder that persisted after undergoing a restrictive procedure, despite adequate counseling. In accordance with our algorithm, the restrictive procedure was converted to a malabsorptive one. The DS is a true malabsorptive procedure, in contrast to gastric bypass, which is a hybrid restrictive-malabsorptive operation [38]. This might explain why the DS has had better long-term results in terms of weight loss [1,2].

Revisional surgery is technically more demanding and time-consuming because of adhesions. Logically, open VBG

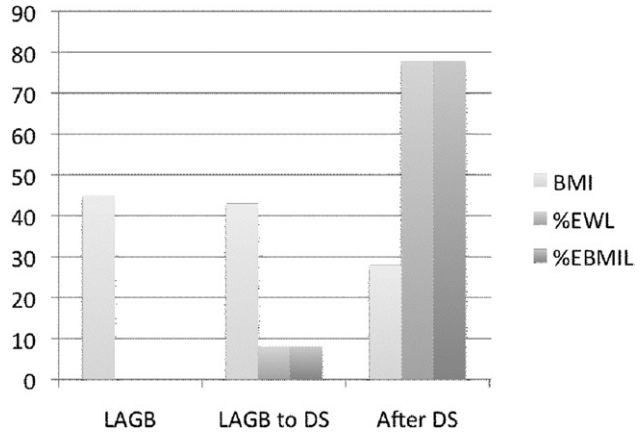

Fig. 1. LAGB to DS: comparison of BMI, %EWL, and %EBMIL at restrictive procedure, at conversion, and during follow-up.

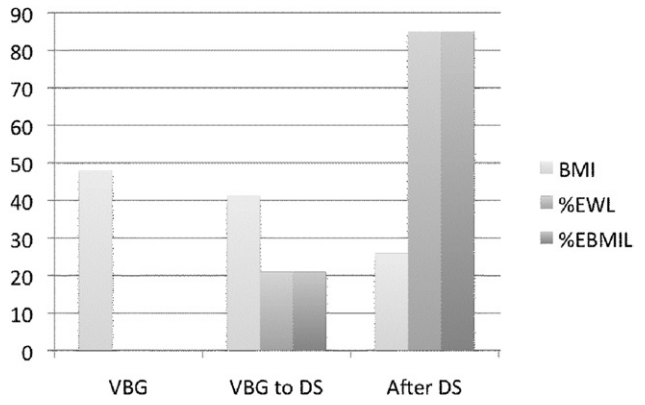

Fig. 2. VBG to DS: comparison of BMI, %EWL, and %EBMIL at restrictive procedure, at conversion, and during follow-up.

induces more adhesions than LAGB. Dense adhesions quite often require conversion to open surgery, with rates up to 46.2–48% [17,39]. In addition to the adhesions, the complexity of the DS construction itself results in a longer operative time. Our operative time was similar to that reported for open surgery [36], in which the conversion of LAGB to DS appeared longer than the conversion of LAGB to LRYGB, 239.7 ± 55.8 minutes versus 135 ± 26.7 minutes, respectively.

Revisional surgery is associated with an increased risk of leaks and complications [40], with an incidence of 29.6–41.7% [41]. Moreover, increasing numbers of revisional surgeries in the same patient, after the first revision, increases the number of complications [41]. In our study, the morbidity and mortality were different after LAGB compared with after VBG.

One patient in the LAGB group (3.2%) died on the third postoperative day of sudden death syndrome, as confirmed by autopsy. Sudden death has occasionally been reported in published studies [42,43]. Prevention is difficult, because the only warning sign seems to be a subtle prolongation of the Q-T interval on electrocardiography. No leaks occurred at the site of the LSG in the LAGB to DS group, which seems to confirm that LSG can be performed safely after LAGB [26].

In the VBG group, 1 of the patients (8.3%) presented with a leak at the site of LSG and shortly thereafter developed a leak at the duodenoileostomy. This patient was treated with endoscopic stents but eventually required total gastrectomy. The patient died 5 months after the conversion. Leaks at the place of the LSG after VBG have been well reported in published studies. Elazary et al. [44] reported on 2 patients (33.3%) with postoperative gastric leak after this conversion. In our study, not only had all the patients undergone an open procedure, but they also had had reinforcement of the gastric pouch stoma by Marlex mesh. Marlex is known to induce severe adhesions [45], and dissecting this mesh from structures carries a high risk of complications [46]. Not surprisingly, in our series, 1 patient with a sleeve leak had the defect right at the intersection of the mesh and the staple line. The morbidity of the revision of VBG to LSG was high compared with the conversion of VBG to LRYGB [44], for which the incidence of leaks has varied from 0% to 12.2% [29,30].

We recorded a total incidence of 33.3% of leaks at the duodenoileostomy in the VBG group, much greater than after primary DS, for which leak rates of 1.5% [47] and 1.7% [48] have been reported (1.8% in our hands). Acute pancreatitis (8.3%), presumably due to duodenal isolation and sectioning, and postoperative respiratory insufficiency (8.3%) occurred more often than after primary DS, for which the incidence has been reported to be 1.7% [48].

During a mean follow-up of >2 years, 20.6% of the surviving patients of DS after LAGB required reoperation for late complications compared with 62.5% of the surviving patients of DS after VBG, with a mean follow-up of almost 4 years. The late complications that occurred in our series were similar to those reported after primary DS and included hiatal hernia [49], excess diarrhea and protein malnutrition [2], internal hernia [50], and abdominal pain [51]. These results confirm the risk of developing these complications after DS as a primary procedure.

In the DS after LAGB group, the %EWL was almost 80% after a mean follow-up of >2 years, comparable to the data reported after primary DS in the same period [2]. This result was superior to the 28% reported at 1 year [37] and the result obtained by conversion of LAGB to LRYGB, for which a %EWL of 52–59% was reported after 12 months [16,20,22] and 62–70% after 18 months [22,36]. In the DS after VBG group, the %EWL was 85% at almost 4 years, similar to that after primary DS [2]. Again, this result was better than that achieved with conversion of VBG to LRYGB, for which a %EWL of 62% was reported at a follow-up shorter than 1 year [30].

Conclusion

According to these results, laparoscopic conversion of LAGB to DS seems feasible and effective, despite 1 death. In our experience, laparoscopic conversion of VBG to DS had an unacceptable rate of complications and deaths.

Disclosures

The authors have no commercial associations that might be a conflict of interest in relation to this article.

References

[1] Marceau P, Biron S, Hould FS, et al. Duodenal switch: long-term results. Obes Surg 2007;17:1421–30.
[2] Hess DS, Hess DW, Oakley RS. The biliopancreatic diversion with the duodenal switch: results beyond 10 years. Obes Surg 2005;15:408–16.
[3] Marinari GM, Murelli F, Camerini G, et al. A 15-year evaluation of biliopancreatic diversion according to the Bariatric Analysis Reporting Outcome System (BAROS). Obes Surg 2004;14:325–8.
[4] Gagner M, Gumbs AA. Gastric banding: conversion to sleeve, bypass, or DS. Surg Endosc 2007;21:1931–5.
[5] Westling A, Ohrvall M, Gustavsson S. Roux-en-Y gastric bypass after previous unsuccessful gastric restrictive surgery. J Gastrointest Surg 2002;6:206–11.
[6] Suter M, Calmes JM, Paroz A, Giusti V. A 10-year experience with laparoscopic gastric banding for morbid obesity: high long-term complication and failure rates. Obes Surg 2006;16:829–35.
[7] Chevallier JM, Zinzindohoué F, Douard R, et al. Complications after laparoscopic adjustable gastric banding for morbid obesity: experience with 1000 patients over 7 years. Obes Surg 2004;14:407–14.
[8] Weiner R, Blanco-Engert R, Weiner S, Matkowitz R, Schaefer L, Pomhoff I. Outcome after laparoscopic adjustable gastric banding—8 years' experience. Obes Surg 2003;13:427–34.
[9] DeMaria EJ, Sugerman HJ, Meador JG, et al. High failure rate after laparoscopic adjustable silicone gastric banding for the treatment of morbid obesity. Ann Surg 2001;233:809–18.

[10] MacLean LD, Rhode BM, Forse RA. Late results of vertical banded gastroplasty for morbid obesity. Surgery 1990;107:20–7.
[11] Sugerman HJ, Kellum JM Jr, DeMaria EJ, Reines HD. Conversion of failed or complicated vertical banded gastroplasty to gastric bypass in morbid obesity. Am J Surg 1996;171:263–9.
[12] van Gewert WG, van Wersch MM, Greve JW, Soeters PB. Revisional surgery after failed banded gastroplasty: restoration of vertical banded gastroplasty or conversion to gastric bypass. Obes Surg 1998; 8:21–8.
[13] Balsiger BM, Murr MM, Mai J, Sarr MG. Gastroesophageal reflux after intact vertical banded gastroplasty: correction by conversion to Roux-en-Y gastric bypass. J Gastrointest Surg 2000;4:276–81.
[14] Tucker O, Sucandy I, Szomstein A, Rosenthal RJ. Revisional surgery after failed laparoscopic adjustable gastric banding. Surg Obes Relat Dis 2008;4:740–7.
[15] Sanchez H, Cabrera A, Cabrera K, et al. Laparoscopic Roux-en-Y gastric bypass as a revision procedure after restrictive bariatric surgery. Obes Surg 2008;18:1539–43.
[16] Langer FB, Bohdjalian A, Shakeri-Manesch S, et al. Inadequate weight loss vs secondary weight regain: laparoscopic conversion from gastric banding to Roux-en-Y gastric bypass. Obes Surg 2008; 18:1381–6.
[17] Van Dessel E, Hubens G, Ruppett M, Balliu L, Weyler J, Vaneerdeweg W. Roux-en-Y gastric bypass as a re-do procedure for failed restrictive gastric surgery. Surg Endosc 2008;22:1014–8.
[18] te Riele WW, Sze YK, Wiezer MJ, van Ramshorst B. Conversion of failed laparoscopic gastric banding to gastric bypass as safe and effective as primary gastric bypass in morbidly obese patients. Surg Obes Relat Dis 2008;4:735–9.
[19] Spivak H, Beltran OR, Slavchev P, Wilson EB. Laparoscopic revision from LAP-BAND to gastric bypass. Surg Endosc 2007;21:1388–92.
[20] Van Wageningen B, Berends FJ, Van Ramshorst B, Janssen IF. Revision of failed laparoscopic adjustable gastric banding to Roux-en-Y gastric bypass. Obes Surg 2006;16:137–41.
[21] Calmes JM, Giusti V, Suter M. Re-operative laparoscopic Roux-en-Y gastric bypass: an experience with 49 cases. Obes Surg 2005;15:316–22.
[22] Mognol P, Chosidow D, Marmuse JP. Laparoscopic conversion of laparoscopic gastric banding to Roux-en-Y gastric bypass: a review of 70 patients. Obes Surg 2004;14:1349–53.
[23] Weber M, Muller MK, Michel JM, et al. Laparoscopic Roux-en-Y gastric bypass, but not rebanding, should be proposed as rescue procedure for patients with failed laparoscopic gastric banding. Ann Surg 2003;238:827–34.
[24] Kothari SN, DeMaria EJ, Sugerman HJ, Kellum JM, Meador J, Wolfe L. Lap-band failures: conversion to gastric bypass and their preliminary outcomes. Surgery 2002;131:625–9.
[25] Gagner M, Gentileschi P, de Csepel J, et al. Laparoscopic reoperative bariatric surgery: experience from 27 consecutive patients. Obes Surg 2002;12:254–60.
[26] Dapri G, Cadière GB, Himpens J. Feasibility and technique of laparoscopic conversion of adjustable gastric banding to sleeve gastrectomy. Surg Obes Relat Dis 2009;5:72–6.
[27] Bernante P, Foletto M, Busetto L, et al. Feasibility of laparoscopic sleeve gastrectomy as a revision procedure for prior laparoscopic gastric banding. Obes Surg 2006;16:1327–30.
[28] Muller MK, Attigah N, Wildi S, et al. High secondary failure rate of rebanding after failed gastric banding. Surg Endosc 2008;22:448–53.
[29] Marsk R, Jonas E, Gartzios H, et al. High revision after laparoscopic vertical banded gastroplasty. Surg Obes Relat Dis 2009;5:94–8.
[30] Mognol P, Chosidow D, Marmuse JP. Roux-en-Y gastric bypass after failed vertical banded gastroplasty. Obes Surg 2007;17:1431–4.
[31] Yashkov YI, Oppel TA, Shishlo LA, Vinnitsky LI. Improvement of weight loss and metabolic effects of vertical banded gastroplasty by an added duodenal switch procedure. Obes Surg 2001;11:635–9.
[32] Keshishian A, Zahriya K, Hartoonian T, Ayagian C. Duodenal switch is a safe operation for patients who have failed other bariatric operations. Obes Surg 2004;14:1187–92.
[33] Coakley BA, Deveney CW, Spight DH, et al. Revisional bariatric surgery for failed restrictive procedures. Surg Obes Relat Dis 2008; 4:581–6.
[34] Wolnerhanssen BK, Peters T, Kern B, et al. Predictors of outcome in treatment of morbid obesity by laparoscopic adjustable gastric banding: results of a prospective study of 380 patients. Surg Obes Relat Dis 2008;4:500–6.
[35] Peterli R, Wolnerhanssen BK, Peters T, Kern B, Ackermann C, von Flue M. Prospective study of a two-stage operative concept in the treatment of morbid obesity: primary Lap-Band followed if needed by sleeve gastrectomy with duodenal switch. Obes Surg 2007;17:334–40.
[36] Topart P, Becouarn G, Ritz P. Biliopancreatic diversion with duodenal switch or gastric bypass for failed gastric banding: retrospective study from two institutions with preliminary results. Surg Obes Relat Dis 2007;3:521–5.
[37] Dolan K, Fielding G. Biliopancreatic diversion following failure of laparoscopic adjustable gastric banding. Surg Endosc 2004;18:60–3.
[38] Buchwald H. Evolution of bariatric procedures and selection algorithm. In: Buchwald H, Cowan GSM, Pories WJ, editors. *Surgical management of obesity.* Philadelphia: Saunders Elsevier; 2007, p. 147–57.
[39] Khaitan L, Van Sickle K, Gonzales R, Lin E, Ramshaw B, Smith CD. Laparoscopic revision of bariatric procedures: is it feasible? Am Surg 2005;71:6–12.
[40] Sugerman HJ, Wolper JL. Failed gastroplasty for morbid obesity: revised gastroplasty versus Roux-Y gastric bypass. Am J Surg 1984; 148:331–6.
[41] Roller EJ, Provost DA. Revision of failed gastric restrictive operations to Roux-en-Y gastric bypass: impact of multiple prior bariatric operations on outcome. Obes Surg 2006;16:865–9.
[42] Wolnerhanssen BK, Langer I, Eriksson U, Schneider M. Sudden death after open gastric bypass surgery. Langenbecks Arch Surg 2009;394:573–7.
[43] Drenick EJ, Fisler JS. Sudden cardiac arrest in morbidly obese surgical patients unexplained after autopsy. Am J Surg 1988;155:720–6.
[44] Elazary R, Hazzan D, Appelbaum L, Rivkind AI, Keidar A. Feasibility of sleeve gastrectomy as a revision operation for failed silastic ring vertical gastroplasty. Obes Surg 2009;19:645–9.
[45] Stocked D, Granstrom L, Backman L, Dahlgren S. Inflammatory response to subcutaneously implanted Marlex and Gore-Tex in massively obese patients. Biomaterials 1992;13:261–3.
[46] Jamieson AC. Vertical banded gastroplasty. In: Buchwald H, Cowan GSM, Pories WJ, editors. *Surgical management of obesity.* Philadelphia: Saunders Elsevier; 2007, p. 167–76.
[47] Hess DS, Hess DW. Biliopancreatic diversion with a duodenal switch. Obes Surg 1998;8:267–82.
[48] Marceau P, Hould FS, Simard S, et al. Biliopancreatic diversion with duodenal switch. World J Surg 1998;22:947–54.
[49] Parikh M, Gagner M. Laparoscopic hiatal hernia repair and repeat sleeve gastrectomy for gastroesophageal reflux disease after duodenal switch. Surg Obes Relat Dis 2008;4:73–5.
[50] Comeau E, Gagner M, Inabnet WB, Herron DM, Quinn TM, Pomp A. Symptomatic internal hernias after laparoscopic bariatric surgery. Surg Endosc 2005;19:34–9.
[51] Hamoui N, Chock B, Anthone GJ, Crookes PF. Revision of the duodenal switch: indications, technique, and outcomes. J Am Coll Surg 2007;204:603–8.