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# Gastric Banding and Bypass for Morbid Obesity – Preoperative Assessment, Operative Techniques and Postoperative Monitoring

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## 1. Introduction

Morbid obesity is a chronic, lifelong, multifactorial, congenital disorder characterised by excessive fat deposits and associated medical, psychological, physical, social, and economic problems. It is also a significant health threat. The extra weight puts unusual stress on all parts of the body. It raises your risk of diabetes, stroke, heart disease, kidney disease, and gallbladder disease. Conditions such as high blood pressure and high cholesterol, which were once thought to mainly affect adults, are often seen in children who are obese. Obesity may also increase the risk for some types of cancer. Persons who are obese are more likely to develop osteoarthritis and sleep apnea. Obesity is the second leading cause of preventable death after smoking. A combination of genetics, environmental issues, and behavioral factors may contribute to the condition (Breznikar & Dinevski, 2009).

Nonsurgical treatment has relapse rates of up to 90%, irrespective of the choice of conservative treatment (Council of Scientific Affairs, 1988). As early as 1991, the U.S. National Institute of Health issued a statement recognizing the known lack of success with conservative forms of treatment, nothing that operations to constrict or bypass the stomach were justified for fully informed and consenting patients and constituted an acceptable risk (National Institute of Health, 1985, Oppert & Rolland-Cachera, 1998).

In 1954, Kremen and Linner introduced jejunoileal bypass. Modifications in the original procedures and the development of new techniques have led to 3 basic concepts for bariatric surgery, as follows: (1) gastric restriction by gastric banding (vertical-banded gastroplasty and adjustable banding), (2) gastric restriction with mild malabsorption (Roux-en-Y gastric bypass), and (3) a combination of mild gastric restriction and malabsorption (duodenal switch) (Masson et al., 1997, Belachew et al., 1997, Gravante et al. 2007).

Bariatric surgery can be undertaken by open and laparoscopic techniques. The latter has become the more popular approach because of its proven (and now well-known)

advantages. GBP is currently the most popular procedure. More than 80% of bariatric procedures in the USA are GBP. It has earned the reputation of being the criterion standard against which other procedures are compared. The procedure has restrictive and malabsorptive components. GBP provides a substantial amount of dietary restriction. The restrictive element of the surgery consists of the creation of a small gastric pouch with a small outlet that, on distention by food, causes the sensation of satiety. In addition, GBP provides a small-to-moderate degree of intentional malabsorption due to the separation of food, which passes through the Roux alimentary limb of the Y, from the biliopancreatic secretions, which pass through the biliopancreatic limb of the Y. The degree of malabsorption can be adjusted by modifying the length of the alimentary and biliopancreatic limbs.

The diversity of clinical- and occult obesity-related comorbidities necessitates a multidisciplinary-team approach in the preoperative evaluation of a morbidly obese the patient: this evaluation enhances outcome. Preoperative cardiac, pulmonary, psychiatric, and endocrine evaluations may be necessary. These evaluations help to exclude patients who may not benefit from surgery. They simultaneously optimize those considered to be good candidates for this type of surgery. Patients should meet all necessary criteria for general surgery.

The contraindications specific to bariatric surgery are:

1. Absence of periods of identifiable medical management
2. A patient who cannot participate in prolonged follow-up
3. Non-stabilized psychotic disorders, severe depression and personality disorders (unless specifically advised by a psychiatrist experienced in obesity)
4. Alcohol abuse and/or drug dependencies
5. Diseases threatening life in the short-term
6. Patients who cannot care for themselves and have no long-term support from their family or social service that warrant such care.

The indications for bariatric surgery are: patients aged 18–60 years with a body mass index (BMI) >40 kg/m<sup>2</sup> or with a BMI 35–40 kg/m<sup>2</sup> with a comorbidity in which surgically induced weight loss is expected to improve the disorder (e.g., metabolic disorders, cardio-respiratory disease, severe joint disease, obesity-related severe psychological problems). The BMI criterion may be the current BMI or a documented previous BMI of identical severity. Bariatric surgery is indicated in patients who exhibit substantial weight loss in a conservative treatment program but who started to regain weight. To be considered for surgery, patients must have failed to lose weight or to maintain long-term weight loss despite appropriate medical care. Patients must have shown compliance with medical appointments. The indication for bariatric surgery for age >60 years or <18 years should be considered on an individual basis.

Preoperative consultation helps in obtaining a detailed diet history and in explaining preoperative and postoperative diet protocol. At our facility, patient preparation for surgery consisted of a detailed explanation (in written and oral form) of the developmental aspect of laparoscopic GBP and its benefits and risks. These included short- and long-term complications, side effects, nutritional sequelae, and the possibility of conversion to an open procedure. Antibiotics were administered perioperatively. Prophylaxis against venous

thrombosis and pulmonary emboli consisted of perioperative pneumatic compression devices and low-dose heparin (s.c.).

After GBP, patients must remain on a high-protein, low-fat diet supplemented with multivitamins, iron, and calcium. Patients must modify their eating habits by avoiding “chewy” meats and other foods that may inhibit normal emptying of their stomach pouch. Nutritional and metabolic blood tests need to be carried out frequently (at 6 months after surgery, 12 months after surgery, and annually thereafter).

Outcomes related to changes in comorbidities, quality of life, and patient satisfaction are assessed for patients with 1 year or more of follow-up. The Bariatric Analysis and Reporting Outcome System (BAROS) was introduced to evaluate bariatric procedures and to compare them worldwide. It consists of a Moorehead Quality of Life (QoL) questionnaire, and documentation of excess weight loss (EWL), medical conditions, complications, and reoperations.

## **2. Bariatric procedures, gastric bypass (GBP)**

GBP is currently the most popular procedure. It has earned the reputation of being the criterion standard, against which other procedures are compared. The procedure has both a restrictive component and a malabsorptive component. GBP provides a substantial amount of dietary restriction. The restrictive element of the operation consists of the creation of a small gastric pouch (approximately 20 mL in volume) with a small outlet that, on distention by food, causes the sensation of satiety. In addition, gastric bypass provides a small-to-moderate degree of intentional malabsorption due to the separation of food, which passes through the alimentary limb of the Y, from the biliopancreatic secretions, which pass through the biliopancreatic limb of the Y. The degree of malabsorption can be adjusted by modifying the length of the alimentary and biliopancreatic limbs.

For all bariatric procedures, pure reversal without conversion to another bariatric procedure is almost certainly followed by a return to morbid obesity. Gastric bypass can be reversed, though this is rarely required. Laparoscopic Roux-en-Y gastric bypass results in substantial weight loss and resolves more than 80% of cases of type 2 diabetes. The investigators suggest that this bariatric operation should be considered the standard of care for morbidly obese type 2 diabetics<sup>5</sup>.

Vitamin D deficiency and elevated PTH are common following GBP and progress over time. There is a significant incidence of secondary hyperparathyroidism in short-limb GBP patients, even those with vitamin D levels  $\geq 30$  ng/mL, suggesting selective Ca<sup>2+</sup> malabsorption. Thus, calcium malabsorption is inherent to gastric bypass. Careful calcium and vitamin D supplementation and long-term screening are necessary to prevent deficiencies and the sequelae of secondary hyperparathyroidism.

Laparoscopic Roux-en-Y gastric bypass is a major elective surgical procedure. The risks are as follows: mortality (1-2% of patients), mainly due to pulmonary embolism or gastrointestinal leak, wound infections, gastrojejunal stomal stricture, marginal ulcers, internal hernia, roux limb ischemia, blow-out of the stomach remnant, long-term nutrient deficiencies (eg, vitamin B12, folate, iron).

## 2.1 Preoperative details

The diversity of clinical and occult obesity-related comorbidities necessitates a multidisciplinary team approach in the preoperative evaluation of the patient who is morbidly obese. This evaluation enhances the postoperative outcome. Preoperative cardiac, pulmonary, psychiatric, and endocrine evaluations may be necessary. These evaluations help to exclude patients who may not benefit from surgery; at the same time, they optimize those considered being potential good candidates. Preoperative nutritional consultation helps in obtaining a detailed diet history and in explaining preoperative and postoperative diet protocol. At our facility, patient preparation for surgery consisted of a detailed explanation in written and oral form of the developmental aspect of laparoscopic GBP and its benefits and risks, including short- and long-term complications, side effects, nutritional sequelae, and the possibility of conversion to an open procedure. Perioperative antibiotics were administered. Prophylaxis against venous thrombosis and pulmonary embolus consisted of perioperative pneumatic compression devices and low-dose subcutaneous heparin.

## 2.2 Postoperative details

After surgery, patients must remain on a high-protein, low-fat diet supplemented with multivitamins, iron, and calcium. Patients must modify their eating habits by avoiding chewy meats and other foods that may inhibit normal emptying of their stomach pouch. Nutritional and metabolic blood tests need to be performed frequently (at 6 months after surgery, 12 months after surgery, and annually thereafter).

We have a monthly support group meeting, where the evaluation of the results is monitored. To evaluate the bariatric procedures and to compare them worldwide, Bariatric Analysis and Reporting Outcome System (BAROS) was introduced (Oria & Moorehead, 1998). It consists of Moorehead Quality of Life questionnaire (QoL), EWL, medical condition, complications, and reoperations (Table 1). Total score is between 1 and 9 in the group with comorbidities and between 0 and 6 in the group with no comorbidities (Table 2), each divided in 5 classes: bad, acceptable, good, very good, and excellent.

Outcomes related to changes in comorbidities, quality of life, and patient satisfaction were assessed for patients with 1 year or more of follow-up. The Moorehead-Ardelt Quality of Life Questionnaire specific for bariatric surgery was administered according to the protocol to assess quality of life changes.

## 2.3 Material and methods

Surgical procedures were performed at Slovenj Gradec General Hospital and Celje General Hospital, Slovenia. An extensive preoperative evaluation consisting of a history and physical examination, nutritional and psychiatric evaluation, and indicated specialty consultations was performed on all patients. Laboratory evaluation included complete blood count, serum chemistries, and thyroid function testing.

The surgical technique was a modification of the technique described by Wittgrove et al. (1994). The patient was placed in a supine position with the surgeon in between the legs, and two monitors above the patient's shoulders. After creation of carbon dioxide pneumoperitoneum (15 mmHg) using the Veress needle technique or entering the abdomen



without gas, just with the optic trocar, ports were placed at the level of mesogastrium; the first one for the camera approximately 12 cm from the xyphoid. The operating table was placed in a steep reverse Trendelenburg position. To expose the esophagus and stomach, the liver retractor was placed through the inferior right subcostal port, and the left lateral segment of the liver was elevated. A 30 ml gastric pouch was created. The endo-linear stapler, 45-mm in length with 3.8-mm staples, was inserted and applied three or four times to staple and cut the gastric pouch with three rows of staples on each side. A gastroenteroanastomosis was then created 40 - 60 cm from the ligament of Treitz using either a circular end-to-end anastomosis stapled technique (first 20 cases) or a linear stapled technique (last 80 cases). The Roux limb was then measured 100 cm distally, or 150 cm distally for the superobese patients. A stapled side-to-side anastomosis was created with the proximal jejunal limb using the endo-linear stapler, 45-mm in length with 2.5-mm, white staples. The enterotomy sites were closed with running suture. All the anastomoses were tested with methylene blue. Lastly, the afferent loop close to the gastroenteroanastomosis was divided with a white cartridge of the linear stapler.

From February 2007 until March 2010, we performed 100 laparoscopic GBP surgeries. Patients were 42.2 years old on average (range 18.9 to 63.3). 87 females were 42.3 years old on average (range 18.9 to 63.3) and 13 males were 41.5 years old on average (range 26.4 to 53.0). Their BMI was 42.6 on average (range 33.4 to 72.3); females 42.7 (range 33.7 to 72.3), males 42.1 (range 33.4 to 49.6).

## 2.4 Results

The mean follow-up was 9.1 months (range 2 - 39 months); 53 patients had 1 or more, 17 patients had 2 or more and 3 patients had 3 or more years of follow up. We had one conversion because of adhesions and one because of bleeding from injured mesentery.

One year after the surgery, 53 patients (47 females and 5 males) lost 32.8 kg on average (range 7.0 to 53.0). Female patients lost 31.8 kg on average (range 7.0 to 53.0); male patients lost 43.0 kg (37.0 to 47.5), 17 patients lost 35.7 kg (11.0 to 57.0) after 2 years, and 3 patients lost 47.3 kg (43.0 to 55.0) after 3 years (Figure 1).

Excess Weight Loss (EWL) was 69.6 % (range 12.2 to 133.4) after 1 year, 76.5% (range 21.0% to 108.4%) after 2, and 86.0% after 3 years (range 71.8 to 104.9) (Figure 2).

$EWL(t) = (\text{max. weight} - \text{weight}(t)) / (\text{max. weight} - \text{weight (BMI25)})$ , while "t" is the time of the interest and weight (BMI25) is the weight of the person at BMI=25 kg/m<sup>2</sup>

Body mass index (BMI) was reduced by 11.6 kg/m<sup>2</sup>; from an average of 42.6 before the operation to 31.0 at one year post-operatively (range 21.4 to 59.5). BMI was further reduced to 29.4 (range 23.5 to 43.5) at 2 years post-operatively, and to 27.4 at 3 years post-operatively (range 24.1 to 31.2) (Figure 3, Table 3).  $BMI = \text{mass (kg)} / (\text{height, m})^2$

A total of 137 comorbidities were identified in our 100 patients. The most common comorbidities included hypertension (34 %), degenerative joint disease (22%), type II diabetes (16%), hypercholesterolemia (7%), and asthma (7%). The comorbidities and their resolution are presented in Table 4. The resolution of diabetes with respect to therapy prior to GBP surgery is presented in Table 5.

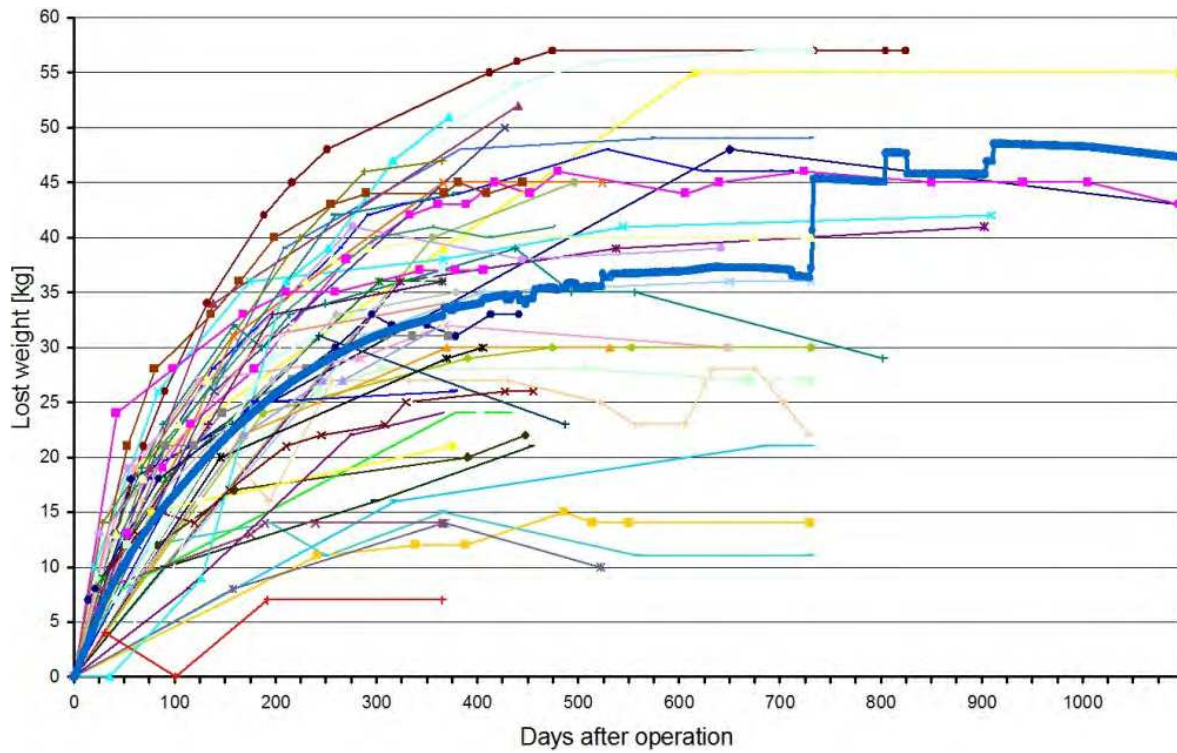


Fig. 1. Weight loss  
(every line presents a patient, a dot in the line is the monitoring point, thick line is mean value)

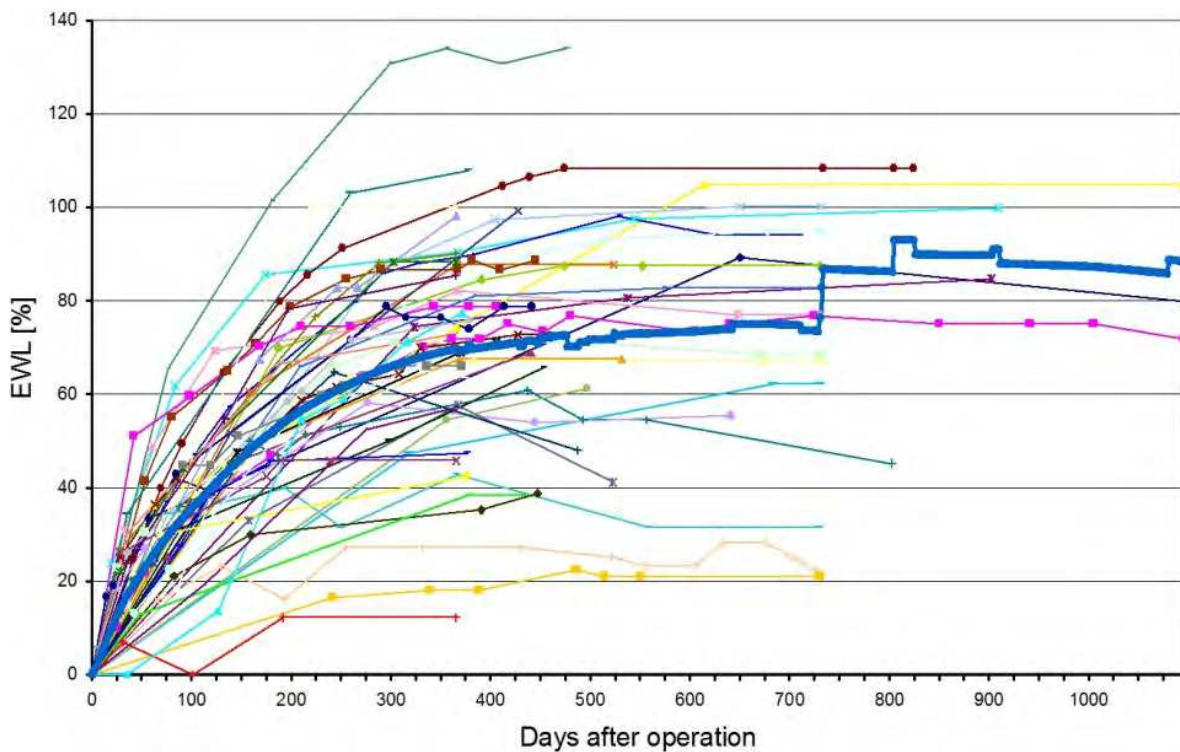


Fig. 2. Excess Weight Loss - EWL  
(every line presents a patient, a dot in the line is the monitoring point, thick line is mean value)

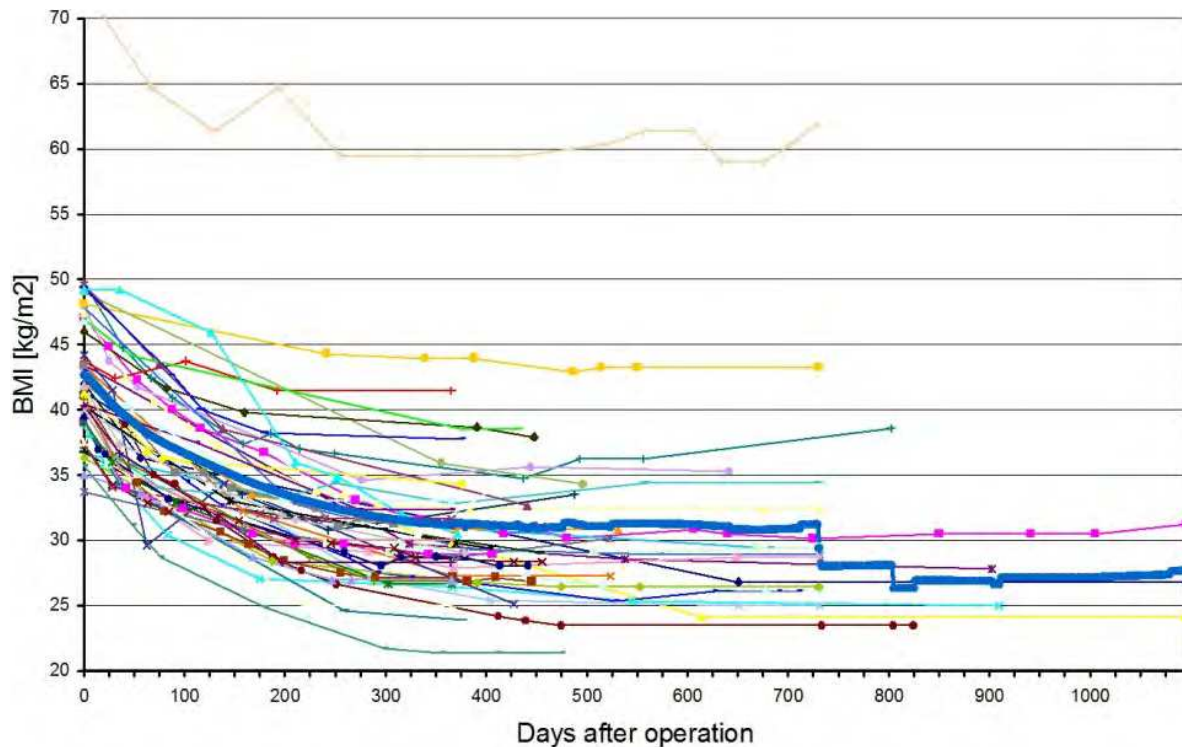


Fig. 3. BMI reduction (every line presents a patient, a dot in the line is the monitoring point, thick line is mean value)

		points
Moorehead questionnaire of QoL		-3 to +3
EWL: weight gain	0 - 24%	-1
	25 - 49%	0
	50 - 74%	+1
	75 - 100%	+2
Medical condition:	worsened	+3
	unchanged	+2
	improved	+1
	resolve a major comorbidity and improve others	0
Complications:	resolve all major comorbidities and improve others	-1
	major	-0.2
reoperation	minor	-1

Table 1. BAROS

The overall mean operating time for the last 50 patients was 90.6 minutes (range 55 to 195). Four patients had early (<30 days) major complications: leakage, ileus, stenosis of entero-entero anastomosis, and small bowel injury. All complications were treated with an additional procedure. Among minor complications were two bleedings from the mesentery



due to a mesentery suturing, and one bleed from the staple line intraluminally. Blood transfusions were sufficient. A port site abscess occurred in one patient. One instance of Peterson's hernia, a late complication, occurred two years after the first operation when Peterson's space wasn't closed. The problem was solved by repositioning the small bowel and closing the defect.

	Patients with comorbidities (total score)	Patients without comorbidities (total score)
bad	<1	<0
acceptable	1 - 3	0 -1.5
good	3 - 5	1.5 -3
very good	5 -7	3 - 4.5
excellent	7 - 9	4.5 - 6

Table 2. BAROS scoring

	1 year-53 pts	2 years-17 pts	3 years-3 pts
Lost weight (kg) (range)	32.8 (7.0-53.0)	35.7 (11.0-57.0)	47.3 (43.0-55.0)
EWL (%) (range)	69.6 (12.2-133.4)	76.5 (21.0-108.4)	86.0 (71.8-104.9)
BMI (kg/m <sup>2</sup> ) (range)	31.0 (21.4-59.5)	29.4 (23.5-43.5)	27.4 (24.1-31.2)

Table 3. Results at 1, 2, and 3 years post-operatively

	all	improved	resolved	no change	no data
Orthopedic symptoms	22	9 (40.9%)	11 (50.0%)	1 (4.5%)	1
Hypertension	34	10 (29.4%)	23 (67.6%)		1
Diabetes	16	6 (37.5%)	9 (56.2%)		1
Hyperlipidemia	7	3 (42.9%)	4 (57.1%)		0
Asthma	7	2 (28.6%)	4 (57.1%)		1

Table 4. Comorbidities

	all	improved	resolved	months to resolution
DM - diet	4	0	4 (100%)	< 1
DM - oral medication	7	3 (42.9%)	4 (57.1%)	10.2 (1-29)
DM - insulin	4	3 (75.0%)	1 (25.0%)	< 1

Table 5. Resolution of diabetes with respect to therapy prior to surgery

Three patients had a gastric bypass performed after insufficient weight loss after sleeve gastrectomy, and four patients had GBP surgery after gastric banding. One bypass was

performed because of migration of the band. Two out of four major complications (ileus and small bowel injury) occurred in redo procedures – after failed bandings. 50 out of 53 patients who were monitored for more than one year answered the Moorehead QoL questionnaire. The total average BAROS score was 6.5 for the group with comorbidities (range 2.8 to 9.0), and 3.2 for the group without comorbidities (range 0.3 to 5.0) – which is “very good” in both groups.

### **3. Bariatric procedures, Adjustable Gastric Banding (AGB)**

The device consists of an adjustable inflatable band placed around the proximal part of the stomach. This creates a small gastric pouch (approximately 15 ml in volume) and a small stoma. Band restriction is adjustable by adding or removing saline from the inflatable band by a reservoir system of saline attached to the band and accessible through a port, which is attached by a catheter to the band. The port is placed subcutaneously in the anterior abdominal wall after the band is secured around the stomach. Adjustment of the band through the access port is an essential part of laparoscopic adjustable gastric banding therapy. Appropriate adjustments, performed up to 6 times annually, are critical for successful outcomes. Patients must chew food thoroughly to allow food to pass through the band. Adjusting the inflation of the cuff changes the size of the opening through which food passes but does not change the size of the gastric pouch; deflation of the cuff is useful when the outlet is obstructed.

Weight loss after laparoscopic adjustable gastric banding is about 50-60% of excess body weight in approximately 2 years. AGB can be completely reversed with removal of the band, tubing, and port.

Laparoscopic adjustable gastric banding was a safe and feasible technique with specific indications in moderately obese patients and, secondarily, in highly obese patients who are unfit for more invasive techniques. In patients with mild-to-moderate obesity, laparoscopic adjustable gastric banding appears to be significantly more effective than nonsurgical therapies in producing weight loss, resolving the metabolic syndrome, and improving quality-of-life outcomes, new study findings suggest.<sup>8,9,11</sup>

#### **3.1 Material & methods**

A clinical study was conducted at Slovenj Gradec General Hospital, Slovenia. We performed 264 gastric bandings (66.5% of all bariatric procedures) between May 2005 and May 2010. On average, patients were 41.0 years old (range 17.2 – 68.8) and had a BMI of 42.4 kg/m<sup>2</sup> (range 34.5 – 59.0). There were 224 female patients (84.8%) with an average age of 41.0 (range 19.5 – 68.8) and a BMI 42.0 kg/m<sup>2</sup> (range 34.5 – 59.0) – table 6. Out of 264 patients, 15 had to have the band removed because of either insufficient weight loss (6 patients, 2.3%), slippage (4 patients, 1.5%), migration (1 patient, 0.4%), band leakage (1 patient, 0.4%), intra abdominal abscess (1 patient, 0.4%), outlet obstruction (1 patient, 0.4%), and personal reasons (1 patient, 0.4%). 4 patients (1.5%) were lost to follow up – table 7 and 8. We followed 192 patients for more than one year. 155 patients (80.7%) were evaluated with BAROS – Bariatric Analysis and Reporting Outcome System, which is a questionnaire assessing the quality of life (QoL), excessive weight loss (EWL), medical conditions, and complications. Scoring is divided into 5 grades ranging from bad to excellent. There are 2

different scoring groups: a group with comorbidities (1 - 9 points) and a group without comorbidities (0 - 6 points). 155 of our patients (80.7%) responded and answered the BAROS questions; 101 with comorbidities and 54 without.

We excluded patients with hormonal disorders and other pathologies preoperatively. Because gastric banding is not appropriate for every patient, we performed a thorough psychological evaluation of all the patients. When needed, we offered preoperative and postoperative psychological and dietary support.

We performed the operation using a pars flaccida technique and secured the band with 1-3 stitches (fundus to the left crus and pouch).

To determine if there is a correlation between EWL and participation in the support group, we performed a statistical analysis on the 192 patients who were monitored for more than 1 year. Background data statistics included frequency and percentage distributions for categorical variables, along with mean values and standard deviations for continuous variables. Pearson correlation coefficient was calculated to conduct univariate strength association between EWL and the number of visits in the support group. We used the linear regression method for calculation of the EWL value (dependent variable) in relation to the number of visits, adjusted by age and gender (Figure 7, Table 13). Statistical analysis was performed with the SPSS 15.0 software (SPSS Inc., Chicago, IL). P value < 0.05 was marked as statistically significant.

### 3.2 Results

192 out of 264 patients were monitored for more than one year after the procedure (172 females and 20 males).

Weight loss; In the first year, patients lost 23.4 kg on average (-1.1 - 52.9); (female 23.3 kg, range -1.1 - 52.9; male 24.6 kg, range 8.4 - 47.7).

Two years after the operation, 118 patients (106 females and 12 males) lost 31.4 kg on average, range -6.3 to 63.8 (female 31.4 kg, range -6.3 - 63.8; male 29.9, range 11.0 - 51.9).

Three years after the operation, 72 patients (67 females and 5 males) lost 33.7 kg on average, range 6.2 to 69.0. Fig. 4.

**EWL;** One year after the operation, EWL was 50.3% on average, range -2.0 -145.3% (female 51.7%, range -2.0 - 145.3%; male 38.3%, range 12.2 - 51.2%).

Two years after the operation, EWL was 65.6% on average (-11.2 to 135.9%); (female 68.0%, range -11.2 - 135.9%; male 43.9%, range 19.0 - 62.5%).

Three years after the operation, EWL was 69.8% on average, range 17.0 to 134.9. Fig 5

**BMI;** The average BMI of all patients before the operation was 42.4 kg/m<sup>2</sup> (range 34.5 - 59.0), 42.0 kg/m<sup>2</sup> for females (range 34.5 - 59.0), and 44.0 kg/m<sup>2</sup> for males (range 34.8 - 55.7).

One year after the procedure, the average BMI was 34.0 kg/m<sup>2</sup> for all patients (range 21.9 - 51.2), 33.6 kg/m<sup>2</sup> for females (range 21.9 - 51.2), and 37.4 kg/m<sup>2</sup> for males (range 29.0 - 45.5).

Two years after the procedure, the average BMI was 31.4 kg/m<sup>2</sup> (range 20.2 - 47.9), 31.0 kg/m<sup>2</sup> for females (range 20.2 - 47.9), and 36.4 kg/m<sup>2</sup> for males (range 31.8 - 43.0).



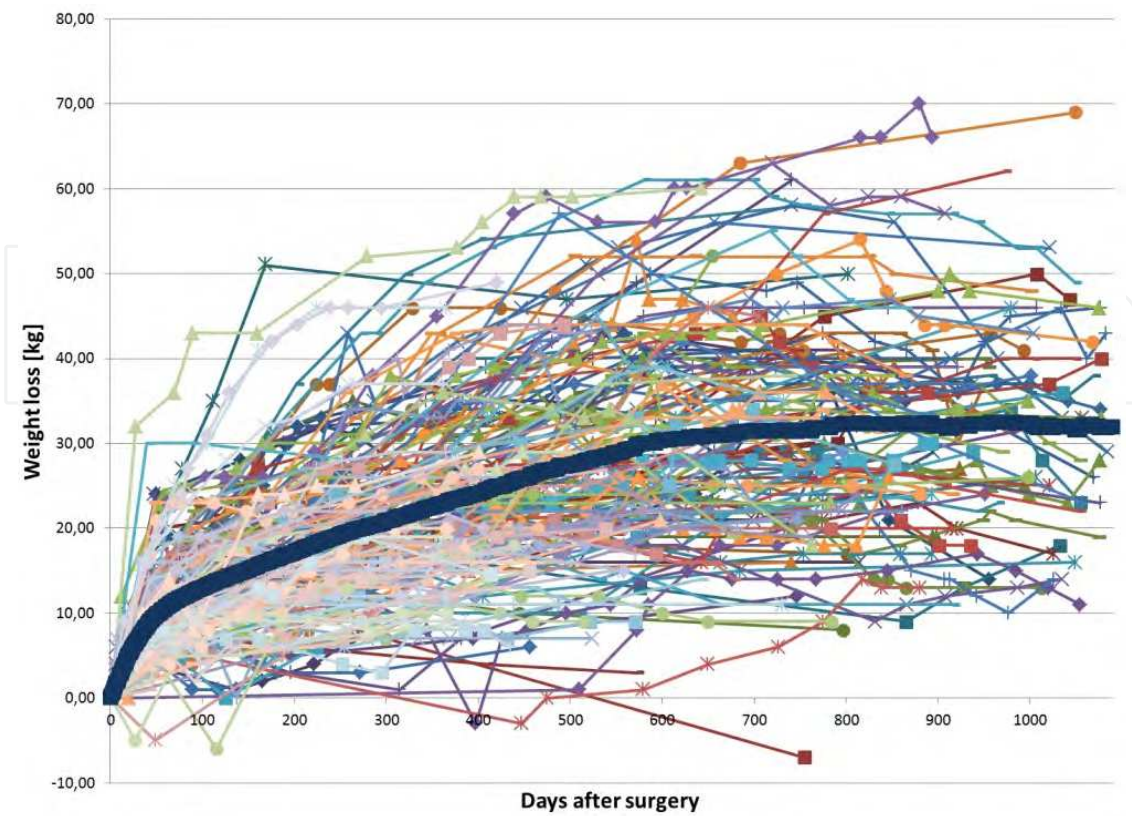


Fig. 4. Weight loss

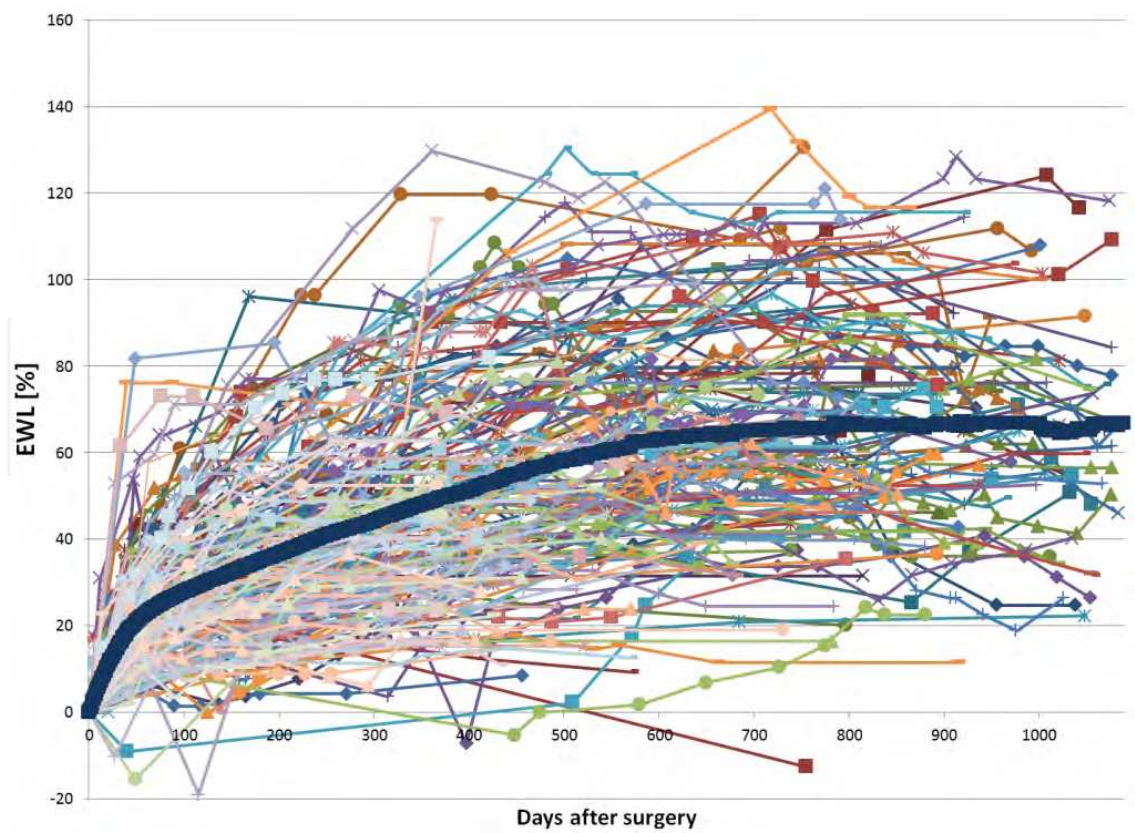


Fig. 5. EWL

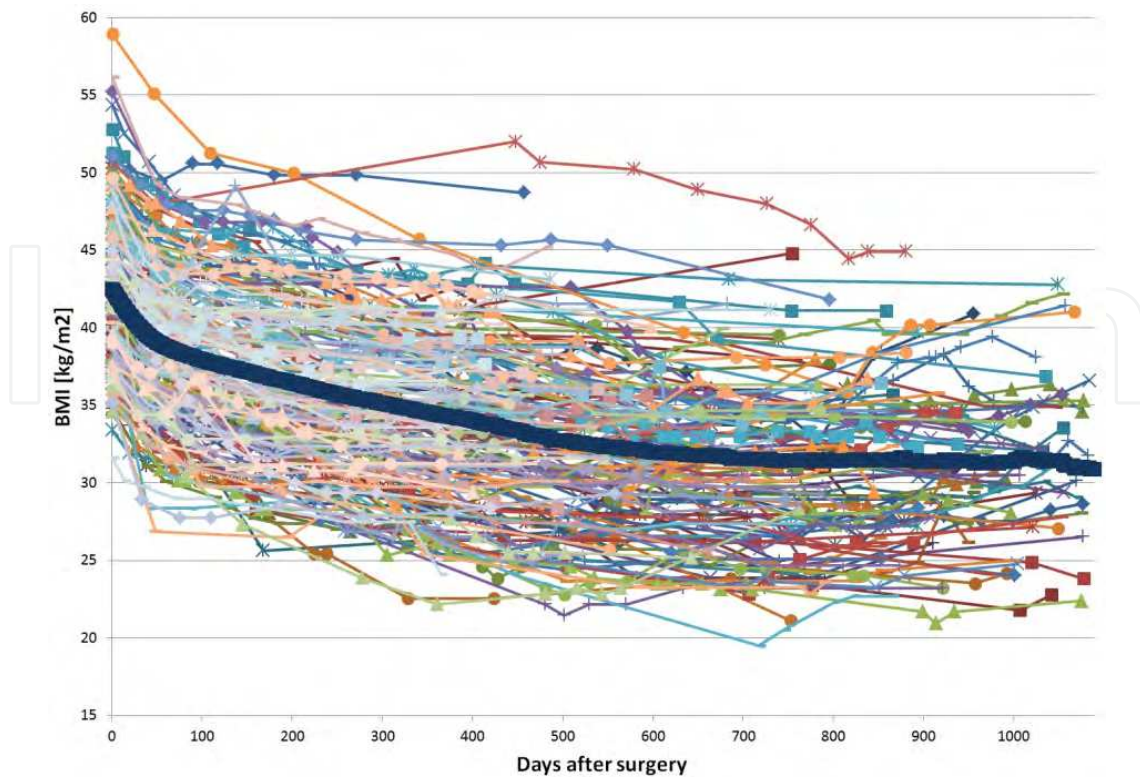


Fig. 6. BMI reduction:

	ALL	FEMALE	MALE
No	264	224	40
AGE	41.0(17.2-68.8)	41.0(19.5-68.8)	41.2(17.2-61.9)
BMI	42.4(34.5-59.0)	42.0(34.5-59.0)	44.0(34.8-55.7)

Table 6. Patients

YEAR OF THE SURGERY	PTS	WITH BAND	WITHOUT BAND	LOST
1 <sup>st</sup>	11	4(36.4%)	6(54.5%)	1(9.1%)
2 <sup>nd</sup>	76	68(89.5%)	8(10.5%)	0
3 <sup>rd</sup>	49	46(94%)	1(2%)	2(4%)
4 <sup>th</sup>	75	74(99%)	0	1
5 <sup>th</sup>	53	53(100%)	0	0
ALL	264	245(92.8%)	15(5.7%)	4(1.5%)

Table 7. Monitoring

Three years after the procedure, the average BMI of all patients was 30.8 kg/m<sup>2</sup> (range 22.4 - 44.0) Fig. 6, Table 10a-c

**Reoperations;** We performed 15 re-operations: 4 (1.5%) bands were removed due to dilatation of the pouch and slippage, 6 (2.3%) due to insufficient reduction of the body weight, and one each (0.4%) due to migration, outlet obstruction, band leakage, intra abdominal abscess, and personal reasons.



**Resolution of comorbidities;** The main obesity-related comorbidities resolved as shown in table 6. We had 31 patients with diabetes. 13 of them (41.9%) improved, 17 (54.8%) had complete resolution of the disease, and one patient (3.2%) was lost to follow up. Out of 51 patients with hypertension, 21 (41.2%) improved, 28 (54.9%) had complete resolution of the disease, one patient (2.0%) showed no change, and one patient (2.0%) was lost to follow up. Out of 17 patients with hyperlipidemia, 6 (35.3%) improved, 9 (52.9%) had complete resolution of the disease, one patient (5.9%) showed no change, and one patient (5.9%) was lost to follow up.

**Complications;** There was no perioperative mortality, no pulmonary embolism, no stomach wall lesions, and no hemorrhage.

Early complications (within 1 month after the procedure): 1 (0.4%) intra abdominal abscess and 1 (0.4%) outlet obstruction.

Late complications (more than 1 month after the procedure): 1 (0.4%) band migration, 4 (1.5%) slippages/dilatations, and 1 (0.4%) band leakage.

**Statistical analysis of support group visits and EWL;** With the Pearson coefficient of  $r=0.58$  ( $p<0.001$ ), we are able to conclude that there is a “moderate to strong” correlation ( $r>0.5$  is usually interpreted as a strong correlation) between the number of visits in the support group and EWL. The distribution between EWL and the number of visits is shown by a scattered plot in Table 12.

Table 12 shows that the number of visits has a statistically significant impact on EWL, while age and gender do not significantly correlate with the EWL.

**Quality of life evaluation;** The average BAROS score was a grade of “good” in both groups: 4.85 in the group with comorbidities and 2.64 in the group without comorbidities. 155 out of 193 patients (80.7%) answered the QoL questionnaire. In the group of 54 patients with comorbidities, the average score for QoL was 1.83 (range -0.4 - 3.0), 1.53 for EWL (range 0 - 3), and 1.66 for medical condition (range 0 - 3). In the group of 101 patients without comorbidities, the average score for quality of life (QoL) was 1.72 (range -2.5 - 3.0), and 1.48 for EWL (range 0 - 3), Table 13.

Year of the surgery	1st	2nd	3rd	4th	5th	TOTAL
migration		1				1(0.4%)
Slippage/ dilatation	1	2	1			4(1.5%)
Insuficient weight loss	3	3				6(2.3%)
Outlet obstruction	1					1(0.4%)
Band leakage	1					1(0.4%)
Personal reasons		1				1(0.4%)
Intra abdominal abscess		1				1(0.4%)

Table 8. Reasons for removing of the band

Characteristics	Patient group (N=192)
EWL	50.3±24.2
Gender (%)	
male	12.4
female	87.6
Age in years	41.7±12.2
Number of visits	2.8±2.0

Table 9. Background data of the patients participating the support group

Monitored years/ No of patients	Weight loss(kg)	EWL(%)	BMI(kg/m <sup>2</sup> )
>1/192	23.4(-1.1-52.9)	50.3(-2.0-145.3)	34.0(21.9-51.2)
>2/118	31.4(-6.3-63.8)	65.6(-11.2-135.9)	31.4(20.2-47.9)
>3/72	33.7(6.2-69.0)	69.8(17.0-134.9)	30.8(22.4-44.0)
>4/4	35.1(25.1-51.7)	82.2(69.0-97.3)	27.6(25.4-29.7)

Table 10.a) Results all

Monitored years/ No of patients	Weight loss(kg)	EWL(%)	BMI(kg/m <sup>2</sup> )
>1/172	23.3(-1.1-52.9)	51.7(-2.0-145.3)	33.6(21.9-51.2)
>2/106	31.4(-6.3-63.8)	68.0(-11.2-135.9)	31.0(20.2-47.9)
>3/67	33.7(6.2-69.0)	71.6(19.5-134.9)	30.3(22.4-41.6)
>4/4	35.1(25.1-51.7)	82.2(69.0-97.3)	27.6(25.4-29.7)

Table 10.b) Results - female

Monitored years/ No of patients	Weight loss(kg)	EWL(%)	BMI(kg/m <sup>2</sup> )
>1/20	24.6(8.4-47.7)	38.3(12.4-79.7)	37.4(29.0-45.5)
>2/12	29.9(11.0-51.9)	43.9(19.0-62.5)	36.4(31.8-43.0)
>3/5	33.5(12.2-51.2)	45.0(17.0-60.6)	36.2(30.9-44.0)
>4/4			

Table 10.c) Results - male

	all	improved	resolved	No change	No data
Diabetes	31	13(41.9%)	17(54.8%)		1(3.2%)
Hypertension	51	21(41.2%)	28(54.9%)	1(2.0%)	1(2.0%)
Hyperlipidemia	17	6(35.3%)	9(52.9%)	1(5.9%)	1(5.9%)

Table 11. Resolution of comorbidities

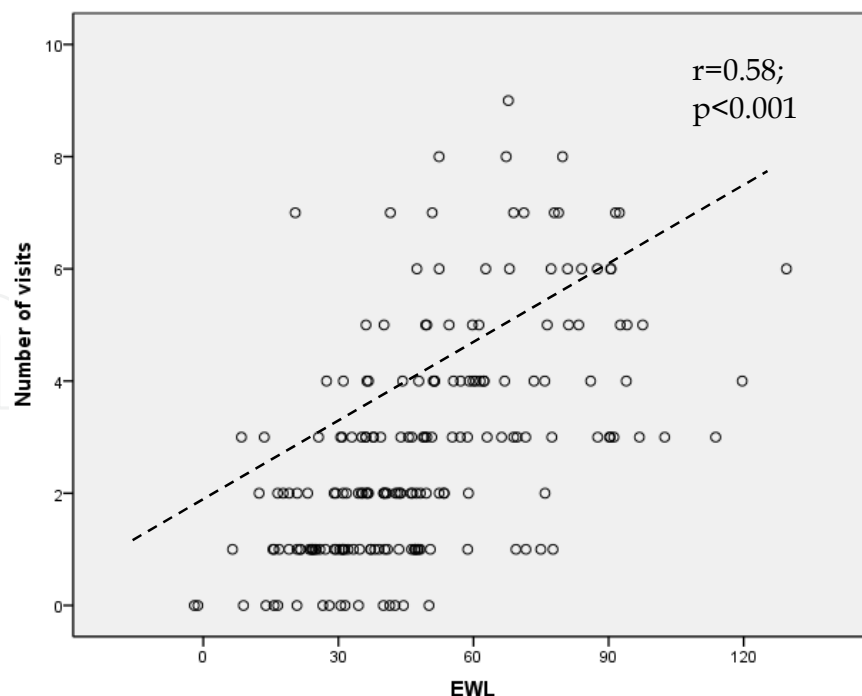


Fig. 7. Relation between number of visits and EWL

	Beta	t	p
Number of visits	0.56	9.32	<0.001
Age	-0.03	-0.57	0.571
Female gender	0.09	1.45	0.148

R<sup>2</sup>=0.341

Table 12. Linear model to calculate EWL

	QoL	EWL	Medical condition	Total score
Comorbidity group	1.83(-0.4-3.0)	1.53(0-3)	1.66(0-3)	4.85(0.2-8.4)
Without comorbidity	1.72(-2.5-3.0)	1.48(0-3)		2.64(-2.5-5.9)

Table 13. BAROS

#### 4. Bariatric procedures, laparoscopic sleeve gastrectomy (LSG)

LSG is a resection of the stomach along the greater curvature. For high-risk obese patients seeking gastric bypass, it may be safer and more effective to first conduct a laparoscopic sleeve gastrectomy, and then perform a Roux-en-Y procedure later, researchers reported at the Society of American Gastrointestinal Endoscopic Surgeons<sup>8</sup>. Laparoscopic sleeve gastrectomy has been advocated as the first of a 2-stage procedure for the high-risk, super-obese patient. More recently, LSG has been studied as a single-stage procedure for weight loss in the morbidly obese. LSG has been shown in initial studies to produce excellent excess weight loss comparable with laparoscopic Roux-en-Y gastric bypass in many series with a very low incidence of major complications and death<sup>10</sup>. LSG will cause many patients to lose weight, which could make them better candidates for the higher morbidity, higher mortality

Roux-en-Y gastric bypass. The data appear to show that LSG only causes short-term weight loss, so in most cases, the Roux-en-Y procedure will likely be required.

## 5. Discussion

Our results are comparable to the ones published in the literature (Schirmer, 2004, Wise et al., 2001, Lippincott & Wilkins, 2003, Gravante et al., 2007 ). In our case, there is a noticeable difference of the early results when we did not have such a strict interdisciplinary approach. Several of our first 20 cases were not really successful because of insufficient psychological and dietary treatment before the operation: our first patient had psychological problems we failed to recognize. She was willing to cooperate, but she did not tell us about her son who used drugs and husband who was an alcoholic. After two years we performed LSG on her. At the beginning, we did not have a psychologist of our own. Our second patient could not change his eating habits, which resulted in slippage of the band. We would be able to predict this deviation today. Next patient from the beginning ate too much and too fast- 5 weeks after the operation an outlet obstruction ocured and we had to remove the band. Among the first ten patients, failiures could be prevented with good psychological evaluation. AGB is a method where patients should be very motivated and willing to cooperate. If one has many of the obsessive-compulsive elements in his character, we cannot expect good results. Frequent monitoring after the operation in a support group is very important as well as immediate emptying of the band if necessary. The diference between those patients who participated in the support group and those who did not is significant- EWL of the group who did not participate in the support group was significantly lower than that of the group where patients were present at least 5 times during the first year (30.7% vs 75.7%).

AGB has indeed been shown in a randomized study to be superior to its open counterpart regarding hospital stay and readmissions (O'Brien et al., 2002). AGB is usually reported to be associated with a low perioperative complication rate and a very low mortality. The mean excess weight loss after 2 or more years is between 45% and 65% (Belachew et al., 2002, Zinzindohoue et al., 2003, Ceelen et al., 2003) ours is 66.9%. Commonly reported long-term complications are band slippage with or without pouch dilatation, band erosion (migration of the band into the stomach), band or port infection, and leaks from the band, port, or connecting tube. Overall, late morbidity affects between 6% and 25% of the patients in series including more than 100 patients. The frequency of each of these complications varies among series. For instance, band slippage occurs at rates between 0.6% and 20%, band erosion at rates between 0% and 11%, and leaks at rates between 1.4% and 26%. We have had two slippages among 120 patients in 2 years, no migrations and no leaks. These late complications lead to reoperations in up to 20% of the patients. Our reoperation rate is 7,5%. We are satisfied of not having fatalities, stomach wall lesions, pneumothorax, haemorrhages, port system complications wound ifections...(literature : fatalities up to 2,1%, somach wall lesions up to 3,5%,haemorrhage up to 2,0%, port or band system complications up to 10,4%...) (Miller, 2005).

The GBP procedure has generally been considered the gold standard based on the availability of long-term results that achieve an approximate 70% excess body weight loss over 7 to 10 years. The correction of comorbid conditions has been reported for diabetes mellitus (83%), hypertension (69%), gastric reflux (100%), urinary stress incontinence, and degenerative joint disease (Schauer et al., 2003, Sugerma et al., 2003, Perry et al., 2004, Lara et al., 2005). Flum and others have shown a significant improvement in survival for a group of patients treated

with surgery compared with conventional treatment (Flum & Delinger, 2004). The cost analysis shows that the recovery of procedure cost is achieved in 12 months (Gallagher et al., 2003). When one considers the improvements in life expectancy, resolution of severe chronic disease, improvement in quality of life, and reduction in risk of cancer, there is hardly a procedure or medication in the history of medicine that can equal the GBP procedure.

Compared to published results our program in laparoscopic bariatric surgery is successful. Significant complications occurred in a few patients as a result of anastomotic leaks (LSG). Fortunately, this and other complications have decreased progressively with experience and improved surgical techniques and new material. We had one abscess in the wound after sleeve. Other complications did not occur at an increased rate. Weight loss was acceptable and resolution of comorbidities occurred as anticipated. With more experience, we perform more and more GBP procedures. At the very beginning we used circular stapler, now we are performing gastro entero anastomosis with a linear one.

## 6. Conclusions

Bariatric surgery has proven to be the best treatment for morbid obesity. AGB is the procedure with less complications, but it is not convenient for everyone. Good preoperative psychological evaluation has proven to be necessary. Super obese patients have a high risk of perioperative complications but AGB is not the best choice. We prefer LSG in such cases. The results suggest that the surgeons practicing bariatric surgery should make efforts to learn the skills for laparoscopic gastric bypass, because it is likely to become the standard of care for the surgical treatment of obesity.

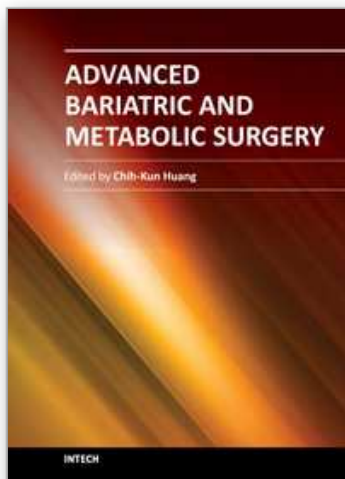
Good results can be expected with interdisciplinary approach after the learning curve. After the operation, the results are significantly better when the patients are regularly monitored. Our study shows that results are the best when they participate in the support group of operated patients guided by a psychologist - especially in patients who underwent gastric banding.

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## **Advanced Bariatric and Metabolic Surgery**

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Bariatric surgery has gained importance in the last 20 years because of the high prevalence of global obesity, and the vast understating of the physiological and pathological aspects of obesity and associated metabolic syndromes. This book has been written by a number of highly outstanding authors and pioneering bariatric surgeons from all over the world. The intended audience for this book includes all medical professionals involved in caring for bariatric patients. The chapters cover the choice of operation, preoperative preparation including psychological aspect, postoperative care and management of complication. It also extends to concept and result of metabolic surgery and scarless bariatric surgery.

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