OBES SURG (2011) 21:288–294
DOI 10.1007/s11695-010-0227-7

CLINICAL REPORT

Quality of Life Parameters, Weight Change and Improvement of Co-morbidities After Laparoscopic Roux Y Gastric Bypass and Laparoscopic Gastric Sleeve Resection—Comparative Study

Elemér Mohos · Elizabeth Schmaldienst · Manfred Prager

Published online: 14 July 2010
© Springer Science+Business Media, LLC 2010

Abstract The laparoscopic Roux Y gastric bypass (LRYGB) and the laparoscopic gastric sleeve resection are frequently used methods for the treatment of morbid obesity. Quality of life, weight loss and improvement of the co-morbidities were examined. Match pair analysis of the prospectively collected database of the 47 gastric bypass and 47 gastric sleeve resection patients operated on in our hospital was performed. The quality of life parameters were measured with two standard questionnaires (SF 36 and Moorehead–Ardelt II). The mean preoperative and postoperative BMI was in gastric bypass group 46.1 and 28.1 kg/m^2 (mean follow-up: 15.7 months) and in gastric sleeve group 50.3 and 33.5 kg/m^2 (mean follow-up: 38.3 months). The SF 36 questionnaire yielded a mean total score of 671 for the bypass and 611 for the sleeve resection patients (p=0.06). The Moorehead–Ardelt II test signed a total score of 2.09 for gastric bypass versus 1.70 for gastric sleeve patients (p=0.13). Ninety percent of the diabetes was resolved in the bypass and 55% in the sleeve resection group. Seventy-three percent of the hypertension patients needed no more antihypertensive treatment after gastric bypass and 30% after sleeve resection. Ninety-two percent of the gastro-oesophageal reflux were resolved in the bypass group and 25% in the sleeve (with 33% progression) group. Ninety-four percent of the patients were satisfied with the result after gastric bypass and 90% after sleeve resection. The patients have scored a high level of satisfaction in both study groups. The gastric bypass is associated with a trend toward a better quality of life without reaching statistical significance, pronounced loss of weight and more remarkable positive effects on the co-morbidities comparing with the gastric sleeve resection.

Keywords Bariatric surgery · Quality of life · Weight loss · Co-morbidities · LRYGB · LGS

Introduction

Bariatric surgery is getting more and more frequent surgical intervention in the developed countries, first of all in the United States and in West Europe. Nowadays more than 200,000 operations are estimated worldwide per year with the indication of morbid obesity. The great majority of these interventions are performed laparoscopic, decreasing the difficulties and the number of complications in the postoperative period [1–4]. Since 2004 bariatric surgical operations have been used regularly in our institution. In the first part of the study period we predominantly performed laparoscopic gastric sleeve resection (LGS). Later, with the growing evidence of the good results with LRYGB [5–8], we have chosen this procedure more often. Currently the LRYGB is the most frequently applied bariatric surgical procedure in our institution. The LGS is a rapid and less traumatic surgical intervention with a good result of weight loss and good resolution of co-morbidities. In case of inefficient weight loss a second surgical step and change to gastric bypass is a generally applied procedure [9, 10]. The LRYGB is a more invasive and more complex

Any commercial interest of the authors is disclosed.

E. Mohos (✉) · E. Schmaldienst · M. Prager
Department of General Surgery, Territory Hospital Oberwart,
Dornburggasse 80,
Oberwart 7400, Austria
e-mail: mohose@freemail.hu

procedure, but it is associated with more effective weight loss and with better control of co-morbidities [11–13]. Nowadays the LSG is applied in our department only to patients with increased operative risk factors (severe co-morbidities, megalo-obesity, etc.). In case of unsatisfactory results, these patients are later—with decreased BMI and with better health conditions—converted to gastric bypass.

In our study we attempted to analyse the end results of these two types of bariatric surgical interventions performed regularly by us focusing on the quality of life, on the loss of weight and on the improvement of co-morbidities.

Patients and Methods

In a study period of 5 years, between January 1, 2004 and January 1, 2009, 82 gastric sleeve resections and 312 gastric bypass operations were performed in our department. In the first 3 years exclusively LSG and from 2007 an increasing number of LRYGB procedures were applied. The data of the patients were collected in a prospective database. Thirteen gastric sleeve patients were excluded because of extreme high BMI (there were no appropriate matched pairs in the gastric bypass group), 11 patients from this group were later converted to gastric bypass and two were lost to the follow-up. Sixty-nine patients after gastric sleeve resection were randomly matched with 69 patients from the gastric bypass patient group according to age, gender and preoperative BMI. The matched pairs, 138 patients were contacted by mail. All the patients received one department specific and two standardised quality of life questionnaires (SF 36 and Moorehead–Ardelt II (MA II)). In case of any missing answer, we tried to reach the patients by phone. Thirty-three patients were lost to the follow-up and three refused to fill in and to return our papers. We received 55 questionnaires all together from the gastric bypass and 47 from the sleeve resection group. In case of sleeve patients without a pair, we have chosen (according to the matching criteria) and contacted another patient from our gastric bypass patient group. At the end, we had appropriate answers from 47 matched pairs of patients according to BMI, age and gender. The average time between the surgical procedure and filling in our papers was 38.3 (9–66) months for the sleeve and 15.7 (8–30) for the bypass patients. We started with gastric sleeve resections in 2004 and with gastric bypass only 2 years later. That is the reason for the difference in follow-up period of the two groups of patients. The indication for bariatric surgery was BMI>40 kg/m^2 or BMI>35 kg/m^2 with co-morbidity (diabetes, cardiovascular disease, severe gastro-oesophageal reflux). The failure of the conservative treatment to promote loss of weight was a prerequisite for the indication. Preoperatively psychiatric and endocrinologic examinations were routinely performed. Medical and anaesthesiological examinations and the necessary functional tests (transoesophageal heart echo, vital capacity, FEV 1) were always fulfilled to evaluate the operative risk factors. In the first 3 years of the study period LGS exclusively was performed by us. With the growing evidence of the good result of LRYGB, we switched to this type of obesity surgery. After 2007, LGS was performed only for the patient with notably increased operative risk factors. A match pair analysis was carried out comparing the data of the two groups of patients focusing on quality of life parameters, loss of weight and improvement of co-morbidities.

Operative Technique

The laparoscopic gastric sleeve is performed in the anti-Trendelenburg position. The greater curvature of the stomach is skeletised from the antrum (4–5 cm proximal from pylorus, vertical division of the Latarjet's nerve) to the angle of His. Then a gastric tube of 42 Ch is introduced into the stomach and aligned medially along the lesser curvature into the duodenum. The vertical resection of the stomach is performed with sequential firing of endogia staplers along the bougie from the gastric antrum to the angle of His.

In case of the gastric bypass procedure, the jejunum is transected 100 cm from the duodeno-jejunal flexure, then a Roux limb of 150 cm is created. A side to side jejuno-jejunal anastomosis is stapled with an endogia [4]. The mesenteric gap is closed using a running non-absorbable suture to prevent the internal hernialisation. At the proximal part of the stomach, a pouch of 30 ml will be created. Between the gastric pouch and the Roux limb, a gastro-entero-anastomosis is performed using a circular stapler of 21 mm. The Roux limb is placed in the antecolic position. The gastro-entero-anastomosis is routinely controlled with intraoperative gastroscopy [14–16]. After both types of surgical procedure, a water soluble contrast study of the upper gastrointestinal tract is performed on the second postoperative day. If there are no anomalies (no leakage, prompt passage is documented), the patient is allowed to drink and the day after the resumption of an oral diet is started. The patients are discharged when they are able to take a sufficient amount of oral fluid and soft food and the necessary clinical and labour result requirements are fulfilled.

Patient Characteristics

The medical records and the department specific questionnaire contained the patient characteristics and medical data. The mean age, preoperative BMI and the rate of co-morbidities were a little bit higher in the gastric sleeve group, but the data are comparable (Table 1).

Table 1 Patient characteristics

	LRYGB (n=47)		LGS (n=47)	p
Age (mean (SD))	38.8 (10.42)		46 (9.22)	0.0013
Gender female/male (n)	35/12		35/12	
Preoperative BMI (kg/m^2, mean (SD))	46.1 (5.78)		50.3 (9.70)	0.0471
Preoperative weight (kg, mean (SD))	132.8 (20.77)		141.0 (29.69)	0.229
Follow-up period (months)	15.7		38.3	
Co-morbidities				
Diabetes (n (%))	10 (21%)	13 (28%)		
Hypertension (n (%))	19 (40%)	23 (49%)		
Gastro-oesophageal reflux (n (%))	24 (51%)	24 (51%)		

The Applied Questionnaires

We have used two standardised quality of life (SF 36 and MA II) and one department specific questionnaires. The SF 36 estimates the physical and the mental well-being of the patients. It is divided into eight aspects: general health, physical functioning, role-physical, role-emotional, social functioning, bodily pain, vitality and mental health. The scores range from 0 to 100 for each dimensions [17]. The MA II is applied as a part of the Bariatric Analysis and Reporting Outcome System (BAROS), but it is extensively used and accepted independently of BAROS, as it was applied in our paper too. It surveys the subjective sentiments and impressions of the patients in six different aspects of the quality of life. These are: general self-esteem, physical activity, social contacts, satisfaction concerning work, pleasure related to sexuality and focus on eating behaviour. The different items are scored from −0.5 to +0.5. The total score is the sum of the six aspects (from−3 to +3). The sum below −2.1 is "very poor", between −2.1 and −1 is "poor", from −1 to +1 is "fair", between +1 and 2.1 is graded "good" and above 2.1, it is "very good" [18]. The department specific questionnaires focused on the weight change, on the satisfaction of the patients with the postoperative result achieved after the surgical procedure, on the accidental reoperations and on the improvement of the most frequent co-morbidities (diabetes type II, hypertension, gastro-oesophageal reflux, degenerative joint disease, sleep apnoea).

Statistical Assessment

The data of the patients were from the previous hospital documentation and from the returned questionnaires collected and computed (Microsoft Excel). The scores of SF 36 were calculated using the handbook and the standard software of the questionnaire. To compare the data (continuous variables) of the two patient's group and to calculate the p value, the Mann–Whitney U test was applied. The different data are expressed as mean values and the standard deviations (SD) are given too. The p value under 0.05 was accepted to sign significant statistical difference.

Results

Weight Change, Satisfaction and Operations in the Postoperative Period

The preoperative and postoperative BMI and body weight were compared in case of LRYGB and LGS patients. The percentage of the excess weight loss was reported too (lost weight/excess weight × 100; excess weight: difference of preoperative weight and calculated weight at BMI 25 kg/m^2). The overall satisfaction of the patients in connection with the result of the two different procedures was asked: 94% of the LRYGB patients and 90% of the LGS patients scored yes. There were in the follow-up period in the gastric bypass group 15 abdominal operations (seven laparoscopic cholecystectomies, four laparoscopic sublay mesh implantations, four adhesion ileus) and four (three laparoscopic sublay mesh implantations, one laparoscopic cholecystectomy) in the gastric sleeve group. The cause of the small bowel ileus in all four cases was an initially used non-absorbable suture material that led to massive adhesions. This type of suture was in the later series replaced with an absorbable one (Table 2).

Quality of Life Parameters

The SF 36 questionnaire resulted 671 points in the gastric bypass group and 602 points in the gastric sleeve group (mean total scores, p=0.0615). This result corresponds with the score of the normal, representative European population [17]. The sum of the physical health scores were 353 points for the bypass patients and 304 points for the sleeve patients. The scores for mental health yielded 318 points after LRYGB and 298 after LGS. The difference between the two groups of patients was more remarkable in view of physical activity. Seven patients in sleeve group and one

Table 2 Results of weight change, patient satisfaction and operations in the postoperative period

	Bypass (n=47)	LGS (n=47)	p
Preoperative BMI (mean kg/m^2 (SD))	46.1 (5.9)	50.3 (9.7)	0.471
Postoperative BMI (mean kg/m^2 (SD))	28.1 (4.9)	33.5 (7.6)	0.001
Reduction of BMI (preop. BMI − postop.BMI) kg/m^2 (SD))	18 (4.2)	16.8 (6.9)	0.074
Preoperative weight (mean kg (SD))	132.8 (20.8)	140.0 (29.7)	0.229
Postoperative weight (mean kg (SD))	80.9 (16.6)	94.0 (21.9)	0.001
Reduction of weight ((preoperative weight − postoperative weight) kg (SD))	51.9 (12.8)	47.3 (19.5)	0.062
Excess weight loss (SD)	88% (0.21)	70% (0.25)	0.0001
Satisfaction with the result	yes: 94%	yes: 90%	
Operations in the postoperative period (sum)	15 (32%)	4 (8%)	
Laparoscopic sublay mesh implantation	4 (8%)	3 (6%)	
Laparoscopic cholecystectomy	7 (15%)	1 (2%)	
Small bowel ileus–adhesiolysis	4 (8%)		

patient in the bypass group achieved a total score under 400 (Table 3).

In respect of the questionnaire MA II, the patients after gastric bypass achieved a total score of 2.09 and after gastric sleeve 1.70. Thirty patients in the bypass group (57%) and 17 patients in the sleeve group (40%) reached a total score between 2.1 and 3 points, which corresponds to a "very good" result (Table 4).

Improvement of Co-morbidities

The changes in diabetes type 2, hypertension, gastro-oesophageal reflux, degenerative joint disease and sleep apnoea were analysed. Ninety percent of the bypass patients and 55% of the sleeve patients with diabetes type 2 became without treatment and diet normoglycaemic in the postoperative period. Hypertension was resolved in 73% of the patients after LRYGB and in 43% of the patients after LGS. Twenty-seven percent of the patients after gastric bypass and 30% after sleeve resection achieved a considerable reduction of the antihypertensive treatment. The LRYGB solved the gastro-oesophageal reflux disease in 92% of the cases. In the group of sleeve resection 25% of the patients became free of reflux symptoms without treatment and 33% of the patients experienced more complaints and needed more anti-reflux drugs after the surgical intervention than before. The symptoms of the degenerative join disease and sleep apnoea are markedly relived in both groups of patients (Table 5).

Table 3 Results of SF 36 questionnaire

	Bypass (n=47)	Sleeve (n=47)	p
General health	82	70	
Physical function	94	81	
Role-physical	93	80	
Bodily pain	84	73	
Role-emotional	87	80	
Social functioning	87	83	
Vitality	76	62	
Mental health	68	73	
Total score	671	602	0.0615

Discussion

The results of the study indicate an effective loss of weight, a relative high score of the quality of life and a remarkable improvement of co-morbidities in both groups of patients. The patients after gastric bypass lost more weight, achieved a higher quality of life scores and the co-morbidities resolved in higher proportion compared with the patients after gastric sleeve.

The two types of surgical intervention lead different ways to weight change: the gastric sleeve resection is an entirely restrictive method reducing eating abilities, the gastric bypass procedure is a restrictive and at the same time a malabsorptive method to lose weight and thus influences the overeating in two ways. It can be one of some other reasons behind (for example, increased occurrence of reflux after sleeve resection) why the life quality scores are higher after LRYGB, but the detected difference does not reach statistical significance. Two different types of life quality query were used. Both target population with morbid obesity [19]. The SF 36 is often applied in many types of medical studies, especially in the evaluation of the surgery of morbid obesity [20]. The MA II is specially developed for obesity patients, easy to apply and highly accepted by the patients [18]. Both queries are frequently applied and internationally widely accepted, so the measured scores of the different types of interventions are

Table 4 Results of Moorhead–Ardelt II questionnaire

	Bypass (n=47)	Sleeve (n=47)	p
General self-esteem	0.38	0.31	
Physical activity	0.37	0.28	
Social contacts	0.42	0.34	
Satisfaction concerning on work	0.35	0.32	
Pleasure related to sexuality	0.24	0.17	
Focus on eating behaviour	0.42	0.28	
Total score	2.09	1.70	0.1301

highly comparable. Our patients in both groups reached a relatively high score. The SF 36 resulted in a mean value of 671 for the bypass and 602 for the sleeve patients, which represents the European standard (p=0.0615). The MA II resulted "very good" and "good" average scores in both groups of patients, 2.09 for gastric bypass and 1.70 for sleeve patients (p=0.1301). Ninety-four percent of the bypass and 90% of the sleeve patients were satisfied with the postoperative result. It signs that the morbidly obese patient may achieve an improved quality of life after bariatric surgery. On the other hand, the majority of the non-operated patients has to face some years later severe physiological and affective disorders [21, 22].

The more considerable loss of weight after gastric bypass may be explained by the fact that this procedure restricts not only the eating ability but decreases the resorption of the nutritives from the small bowel. The changed resorption results changes in the hormonal secretion of the small bowel, which plays an important role—in addition to weight loss—in the complete remission of diabetes type 2 experienced in the majority of patients after gastric bypass. Probably these—not yet totally discovered—biochemical pathways of the foregut are responsible for the fact that higher proportion of the diabetes type 2 is resolved after gastric bypass compared with gastric sleeve resection. Current data suggest that surgical treatment should be extended to patients with diabetes type 2 under BMI 35 [23, 24]. In our series, the diabetes type 2 resolved in nine from ten (90%) patients among bypass patients and 7 from 13 (55%) after sleeve resection.

In connection with the gastro-oesophageal reflux, it is important to stress the advantage of the gastric bypass to gastric sleeve. The minimal acid production of the gastric

Table 5 The improvement of co-morbidities after LRYGB and LGS

		Bypass (n=47)	Sleeve (n=47)
Diabetes type 2	Number of patients	10	13
	Resolved	9 (90%)	7 (55%)
	Th. reduction	1 (10%)	4 (30%)
	No change	–	2 (15%)
Hypertension	Number of patients	19	23
	Resolved	14 (73%)	10 (43%)
	Th. reduction	5 (27%)	7 (30%)
	No change	–	6 (27%)
Gastro-oesoph. reflux	Number of patients	24	24
	Resolved	22 (92%)	6 (25%)
	Th. reduction/alleviation	1 (4%)	5 (21%)
	No change	1 (4%)	5 (21%)
	Progression	–	8 (33%)
Degenerative joint disease	Number of patients	29	31
	Resolved	–	–
	Th. reduction/alleviation	28 (97%)	22 (71%)
	No change	1 (3%)	9 (29%)
Sleep apnoea	Number of patients	7	16
	Resolved	5 (72%)	1 (6%)
	Alleviation	1 (14%)	9 (56%)
	No change	1 (14%)	6 (38%)

pouch results in no acidic oesophagitis and the Roux loop of 100–150 cm inhibits the biliary reflux. In our study in 92% of the patients the reflux was resolved by gastric bypass operation. After gastric sleeve resection, 25% of the patients became free of reflux disease and 33% of the patients experienced progression of the symptoms that may be caused by the slowed emptying of the gastric tube.

The high incidence of gall stone formation and cholecystectomies in the first series of our bypass patients (13%) made us introduce desoxursocholic acid treatment in the first 6 months—when the weight lost is most intensive—after the surgical intervention [25, 26].

Some limitations must be considered by interpretation of our data. First, we excluded 13 sleeve patients from the study. They had extreme high preoperative BMI values, and we were unable to find appropriate matched pairs to these patients in the gastric bypass group. Eleven of them were later converted to gastric bypass because of insufficient loss of weight and two were lost to the follow-up. Severe gastro-oesophageal reflux and diabetes type 2 were taken into consideration too by the indication of the conversion to gastric bypass by these patients. The data of these patients were not analysed and we did not calculate with them. The difference of the examined parameters between the gastric bypass and gastric sleeve patients with these data would be even more considerable. Second, the average follow-up period by the sleeve patients were more than double that of the gastric bypass patients 38.3 and 15.7 months, respectively. As the vast majority of the patients are in a stable weight situation 10–12 months after the surgical intervention, we think that the two groups are comparable. Third, the preoperative BMI is higher in the gastric sleeve group just reaching statistical significance ($p=0.0471$), but the difference in postoperative values of weight loss are much more remarkable (p of postoperative BMI is 0.001 and p of excess weight loss is 0.0001) demonstrating that the gastric bypass surgery leads to more considerable loss of weight compared to sleeve resection.

We conclude that both groups of patients reached a good level of the quality of life and weight loss. The majority of the patients are satisfied with the results after both types of intervention. The LRYGB is superior to LGS in view of weight loss and of control of the most frequent co-morbidities (diabetes type 2, GER, hypertension). The quality of life scores seem to be better after gastric bypass, but the measured difference does not reach statistical difference. Therefore, our first choice in obesity surgery is the LRYGB. We indicate gastric sleeve resection first of all for patients with considerable risk factors (megalo-obesity, unsatisfactory general condition). It is technically easier to perform, the operative time is shorter, the results are acceptable and the postoperatively experienced high occurrence of reflux may be reduced by screening of the patients in view of GER. This may ensure improved quality of life after gastric sleeve resection. In case of insufficient loss of weight, it can be converted later (with better health conditions and with lower BMI) to gastric bypass.

Conflict of Interest The authors declare that they have no conflict of interests.

References

1. Müller MK, Wenger C, Schiesser M, et al. Quality of life after bariatric surgery—a comparative study of laparoscopic banding vs. bypass. Obes Surg. 2008;18:1551–7.
2. Weller WE, Rosati C. Comparing outcomes of laparoscopic versus open bariatric surgery. Ann Surg. 2008;248:10–5.
3. Fullum TM, Aluka KJ, Turner PL. Decreasing anastomotic and staple line leaks after laparoscopic Roux Y gastric bypass. Surg Endosc. 2009;23:1403–8.
4. Lanno M, Smet B, Miserez M, et al. Laparoscopic totally stapled entero-enterostomy: a safe and reproducible new technique. Obes Surg. 2008;18:513–6.
5. Lancaster RT, Hutter MM. Bands and bypasses: 30-day morbidity and mortality of bariatric surgical procedures as assessed by prospective, multi-center, risk-adjusted ACS-NSQIP data. Surg Endosc. 2008;22:2554–63.
6. Fazylov R, Soto E, Merola S. Laparoscopic Roux-en-Y gastric bypass in morbidly obese patients >55 years old. Obes Surg. 2008;18:656–9.
7. Müller MK, Attigah N, Wildi S, et al. High secondary failure rate of rebanding after failed gastric banding. Surg Endosc. 2008;22:448–53.
8. Hell E, Miller KA, Moorehead MK, et al. Evaluation of health status and quality of life after bariatric surgery: comparison of standard Roux-en-Y gastric bypass, vertical banded gastroplasty and laparoscopic adjustable silicon gastric banding. Obes Surg. 2000;10:214–9.
9. Benedix F, Sheidbach H, Arend J, et al. Revisionseingriffe nach bariatrischen operationen—überblick über komplikationsspektum und derzeitige therapeutische optionen. Zentralbl Chir. 2009;134 (3):214–24.
10. Langer F, Zacherl J, Jakesz R, et al. Does gastric dilatation limit the success of sleeve gastrectomy as a sole operation for morbid obesity? Obes Surg. 2006;16:166–71.
11. Auyang ED, Murayama KM, Nagle AP. Five-year follow-up after laparoscopic Roux-en-Y gastric and partial ileal bypass for treatment of morbid obesity and uncontrolled hyperlipidaemia. Obes Surg. 2009;19:121–4.
12. Ballantyne GH, Wasielewsky A, Saunders JK. The surgical treatment of type ii diabetes mellitus: changes of HOMA insulin resistance in the first year following laparoscopic Roux-en-Y gastric bypass (LRYGB) and laparoscopic adjustable gastric banding (LAGB). Obes Surg. 2009;19:1297–303.
13. Ahmed AR, Rickards G, Coniglio D, et al. Laparoscopic Roux-en-Y gastric bypass and its early effect on blood pressure. Obes Surg. 2009;19:845–9.
14. Kligman MD. Intraoperative endoscopic pneumatic testing for gastrojejunal anastomosis integrity during laparoscopic Roux-en-Y gastric bypass. Surg Endosc. 2007;21:1403–5.
15. Shin RB. Intraoperative endoscopic test resulting in no postoperative leaks from the gastric pouch and gastrojejunal anastomosis

in 366 laparoscopic Roux-en-Y gastric bypasses. Obes Surg. 2004;14:1064–9.
16. Champion JK, Hunt T, DeLisle N. Role of routine intraoperative endoscopy in laparoscopic bariatric surgery. Surg Endosc. 2002;16:1663–5.
17. Ellert U, Bellach BM. The SF 36 in Bundesgesundheitssurvey. Gesundheitswesen. 1999;61:184–90.
18. Moorehead MK, Ardelt-Gattinger E, Lechner H, et al. The validation of the Moorehead–Ardelt quality of life questionnaire II. Obes Surg. 2003;13:684–92.
19. Duval K, Marceau P, Pérusse L, et al. An overview of obesity-specific quality of life questionnaires. Obes Rev. 2006;7:347–60.
20. Wolf AM, Falcone AR, Kortner B, et al. BAROS: an effective system to evaluate the results of patients after bariatric surgery. Obes Surg. 2000;10:445–50.
21. Buddeberg-Fischer B, Klaghofer R, Krug L, et al. Physical and physiological outcome in morbidly obese patients with and without bariatric surgery: a 41/2-year follow-up. Obes Surg. 2006;16:321–30.
22. Karlsson L, Taft C, Rydén A, et al. Ten-year trends in health-related quality of life after surgical and conventional treatment for severe obesity: the SOS intervention study. Int J Obes. 2007;31:1248–61.
23. Poris W. Type-II diabetes. Dauerhafte remission durch chirurgie des forguts. Chiurg. 2009;80:416–21.
24. Barclay L. Recommendations Issued for Use of Gastrointestinal Surgery to treat Type 2 Diabetes. Ann Surg. 2009, Nov.19.
25. Patel JA, Patel NA, Piper GL, et al. Management of cholelithiasis in patients presenting for laparoscopic Roux-en-Y gastric bypass: have we reached a consensus? Am Surg. 2009;75:470–6.
26. Tucker ON, Fajnwaks P, Szomstein S, et al. Is concomitant cholecystectomy necessary in obese patients undergoing laparoscopic gastric bypass surgery? Surg Endosc. 2008;22:2450–4.