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## Surgical treatment of obesity

## Chirurgiczne leczenie otyłości

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### Summary

Bariatric surgery currently seems to be the most effective method for durable weight loss. In contrast to conservative treatment it allows for complete resolution of the majority of co-morbidities in a large number of cases. In recent decades an increasing number of patients requiring treatment for obesity and the rapid increase in the number of procedures around the world can be seen. In 2011, the number of bariatric surgery in the world exceeded 340,000. In Poland, at the same time, 1,250 operations of this type were performed. The most commonly performed surgery is Roux-en-Y gastric bypass. Among the recognized methods of surgical treatment of obesity there are new procedures. Their effectiveness in terms of durable weight loss requires further investigations. Still one of the most effective methods is biliopancreatic diversion with duodenal switch. In the treatment of obesity, in addition to bariatric surgeon, a multidisciplinary team plays an important role. It should consist of an experienced general practitioner, endocrinologist, psychologist and dietician. In order to increase the effectiveness of treatment is necessary to modify eating habits and daily physical activity. The type of operation should be selected individually for each patient. Treatment outcomes reporting methodology should be clearly defined. This concerns both the criteria for the calculation of weight loss and resolution of co-morbidities. This paper presents a general comment on the surgical treatment of obesity taking into account the most commonly and novel surgical methods.

Key words: surgical treatment of obesity, results, methods

### Streszczenie

Leczenie chirurgiczne w chwili obecnej wydaje się najbardziej skuteczną metodą trwałej redukcji masy ciała. W przeciwieństwie do metod zachowawczych pozwala uzyskać, w dużej części przypadków, całkowite ustąpienie większości schorzeń towarzyszących otyłości. W ostatnich dekadach można zauważyć stale zwiększającą się ilość osób wymagających leczenia z powodu otyłości oraz gwałtowny wzrost liczby wykonywanych operacji na całym świecie. W 2011 roku liczba operacji bariatrycznych na świecie przekroczyła 340 tysięcy. W Polsce w tym samym czasie wykonano 1250 tego typu operacji. Najczęściej wykonywaną operacją jest ominięcie żołądkowo-jelitowe na pętli Roux. Wśród uznanych metod leczenia operacyjnego pojawiają się stale nowe procedury. Ich efektywność, w zakresie trwałej redukcji masy ciała wymaga dalszych obserwacji. Nadal do najbardziej skutecznych metod należy wyłączenie żółciowo-trzustkowe z przetłoczeniem dwunastnicy. W leczeniu otyłości, poza chirurgiem wyspecjalizowanym w operacjach bariatrycznych ważną rolę odgrywa wielospecjalistyczny zespół w skład którego powinni wchodzić: doświadczony internista, endokrynolog, psycholog oraz dietetyk. W celu zwiększenia skuteczności leczenia konieczna jest modyfikacja nawyków żywieniowych oraz codziennej aktywności fizycznej. Rodzaj operacji powinien być dobierany indywidualnie dla każdego pacjenta. Metodyka raportowania wyników leczenia powinna być ściśle określona. Dotyczy to zarówno kryteriów kalkulacji utraty masy ciała jak i ustępowania chorób towarzyszących. W pracy przedstawiono ogólne uwagi na temat chirurgicznego leczenia otyłości z uwzględnieniem najczęściej stosowanych i nowych metod operacyjnych.

Słowa kluczowe: chirurgiczne leczenie otyłości, wyniki, metody

### INTRODUCTION

Over the past few decades obesity has become an important health problem. This problem mainly relates to well developed countries. To a greater extent, it is also becoming crucial in Poland. Obesity is

accompanied by disturbances associated with overweight such as type 2 diabetes mellitus, dyslipidemia, hypertension, circulatory system diseases, obesity hypoventilation syndrome and degenerative lesions of the osteoarticular system. Conservative treatment,

which mainly includes modification of existing eating habits and daily physical activity, usually does not provide any permanent effect. In the majority of patients in the long-term prospective, maintaining a beneficial relationship between the amount of energy intake and expenditure fails. In addition, implementation of fully effective pharmacological measures, which allow effective treatment of pathological obesity, has not been successful so far. After body mass reduction achieved by conservative treatment, patients manifest increased appetite, disturbed evaluation of the amount of consumed food and a tendency to consume high calorie foods (1, 2). After body mass reduction in obese patients, consuming large amount of food does not affect hunger and it does not provide feeling of fullness to such extent as it does in case of persons with normal body mass (3). Surgical treatment is an attractive alternative mainly because of the degree of body mass reduction and the permanency of obtained effects (4). It was also shown that surgical treatment is more beneficial compared to conservative treatment in terms of remission in comorbidities (5, 6). Over the past decade, the number of performed bariatric surgeries significantly increased. This phenomenon was undoubtedly affected by development of laparoscopic techniques and continuously increasing awareness of this problem, not only among patients, but also among physicians (7). In 2011 – 340,768 bariatric procedures were performed all over the world. This is a significant increase compared to 2003, when there was only 146,301 surgeries performed. The most frequently performed surgery was Roux-en-Y gastric bypass (RYGB) – 46.6%, sleeve gastrectomy – 27.8% (SG), adjustable gastric banding (AGB) – 17.8% and biliopancreatic diversion with duodenal switch (BPD – DS) – 2.2%. In the same paper, tendencies regarding a change in the percent share of the respective types of surgeries in the general number of bariatric procedures were evaluated. Data collected in 2003, 2008 and 2011 were compared. A downward tendency was noted in the case of Roux-en-Y gastric bypass, 65.1, 49.0 and 46.6%, respectively, and in the case of biliopancreatic diversion, 6.1, 4.9 and 2.1%, respectively. In 2011, there was a significant increase in the percent share of sleeve gastrectomy in the general number of conducted surgeries, from 0.0 through 5.3 to 27.89%, respectively. In the case of adjustable gastric banding, after an initial increase from 24.4% in 2003 to 42.3% in 2008, a decrease took place in 2011 to 17.8%. The most surgeries were performed in the U.S. and in Canada – 101,645, in Brazil – 65,000, in France – 27,648 and in Mexico – 19,000. In 2011, 1,250 surgeries were performed in Poland. The number of the respective types of surgeries performed in our country were as follows: adjustable gastric banding – 256, sleeve gastrectomy – 516, Roux-en-Y gastric bypass – 381, mini gastric bypass – 65, biliopancreatic diversion – 5, biliopancreatic diversion with duodenal switch – 3, banded gastroplasty – 10, other – 14. The proportion of the number of surgical procedures to the

number of citizens in Poland was 0.0033 and the same proportion in the U.S. and in Canada – 0.0326 and in Belgium – 0.7722 (8).

#### INDICATIONS FOR SURGICAL TREATMENT

The generally adopted qualification criteria for surgical treatment include: BMI > 40 kg/m<sup>2</sup> or BMI 35-40 kg/m<sup>2</sup> and the coexistence of at least one obesity-dependant diseases such as: hypertension, type 2 diabetes mellitus, severe sleep apnea syndrome, dyslipidemia and motor organ diseases resulted in limiting mobile activity. In a majority of centers, patients in the age of 18-60 are qualified for surgical treatment. Additional conditions to be met if surgical methods are used include a patient's complete understanding of the purposes and principles of surgical treatment, informed consent for treatment, approval for the type of proposed treatment, willingness to constantly cooperate during the postoperative period and a lack of general contraindications for surgical procedure and general anesthesia. In the case of body mass index 30-35 kg/m<sup>2</sup>, indications for surgical treatment should be individually determined depending on the type of comorbidities. It is also possible to qualify patients below 18 years of age for surgical treatment (9). In the case of patients over 60 years old, the qualification for the procedure takes place after evaluating the balance between the benefits and risk of complications. In these patients, surgical treatment may be used, but rather to achieve a better quality of life but not for the purpose to extend their lives. Currently, past attempts of using conservative treatment are not a necessary condition to qualify for surgical treatment. Sometimes it is questionable what weight should be assumed for the calculation of the body mass index, which would be the base to qualify for surgical treatment. In some centers, the highest weight reached by the patient is considered. The most frequently, however, qualification is made on the base of current body mass. It should be kept in mind that the reduction of body mass, which takes place during the preparation period before the surgical procedure, should not result in changing the qualification for treatment.

#### OVERVIEW OF SURGICAL METHODS

The main mechanisms leading to body mass reduction as a result of surgical treatment include limiting the volume of consumed food and limiting its absorption. The action of each of these factors leads to a decrease in energy value of absorbed food. Restrictive surgeries, i.e. limiting the volume of consumed food, include: gastric plication, vertical banded gastroplasty (currently performed less often), placement of adjustable gastric banding and sleeve gastrectomy. Recently, reports have been published regarding endoscopic methods using restrictive mechanisms. These methods include transoral vertical gastroplasty. Surgical procedures, which use both mentioned mechanisms, i.e. restrictive and malabsorptive procedures, include: Roux-en-Y gastric bypass, mini gastric bypass and biliopancreatic

diversion with duodenal switch. Procedures with malabsorption as the main mechanism of action include biliopancreatic diversion. Presently, each of these surgeries may be performed using the laparoscopic method. A perfect bariatric surgery should be safe, easy to perform, and lead to significant body weight loss, a high level of patient's satisfaction and minimum pain in the postoperative period. The level of early and late complications should be low. The duration of a procedure and hospitalization period should be short, and convalescence as well as return to professional activity should be fast. Achieved body mass reduction should be permanent and the achieved results should be easy to evaluate. A given method should not lead to nutritional deficiencies, and in case of their occurrence, treatment should be relatively easy. The surgery should be performed by an experienced surgeon involved in bariatric or metabolic surgery (10). An overview of the most frequently performed bariatric surgeries with consideration of some interesting methods introduced in recent years is presented below.

#### TRANSORAL VERTICAL GASTROPLASTY – TOGa®

In this procedure, a stomach cuff is created using a specially designed stapler, through the intraoral approach under endoscopic control. Suturing with titanium staples leads to bringing the abdominal walls closer to each other. By placing consecutive staples, a cuff of desired length and diameter is created. This procedure takes place under general anesthesia. In the study to compare the efficacy of transoral vertical gastroplasty with Roux-en-Y gastric bypass and biliopancreatic diversion, the following results were obtained in terms of %EBMIL: after 12 months: TOGa® – 43.1% (5.2-85.8), RYGB – 73% (48.4-105.4), BPD – 77.8% (53.6-92), and after 24 months: 37.7% (-11.4-87.9), 81.1% (51.7-119.7) and 79.1% (57.3-111.8), respectively. A better effect in a group with vertical gastroplasty was achieved in patients with lower baseline BMI (<45 kg/m<sup>2</sup>). No complications were reported in reference to this method (11).

#### ADJUSTABLE GASTRIC BANDING – AGB

In this surgery, a ring made of synthetic material is placed below the gastro-esophageal junction and small reservoir with a volume of 20-30 ml is made in the superior part of the stomach. By suturing the fundus of the stomach above the banding, a possible change of its position is limited. It is possible to control the degree of restriction with a subcutaneous port. This surgery is associated with a small number of perioperative complications and very low perioperative mortality rate. A relatively high rate of repeated surgeries, which results from the necessity to remove the band due to late complications or due to a change in its initial position, is a serious disadvantage of this method. The efficacy of this method was confirmed in terms of permanency in body mass reduction in longer periods of observation (12). The percent share of laparoscopic adjustable gastric banding in the general number of surgeries

performed in Europe decreased from 63.7% in 2003 to 17.8% in 2011 (8).

#### LAPAROSCOPIC GASTRIC PLICATION – LGP

This is a new and not very popular method. In a systematic review based on analysis of data regarding 307 patients, the following results were obtained: duration of the surgery ranged from 40 to 150 minutes, %EWL ranged from 53.4 – 67% after 12 months, and within a three-year observation period, the mean percentage of excess body weight loss was 57%. The authors emphasize the necessity to conduct prospective, randomized studies to compare this method with other bariatric procedures (13). In the study describing the effects of laparoscopic gastric plication in 244 patients, the following results were obtained: mean duration of surgery was approximately 70 minutes, after 6 months, mean %EWL was 31.8%, and in the case of type 2 diabetes mellitus, a significant improvement or total remission was achieved in 96.9% of cases. During the first days following surgical procedure, vomiting was reported by some patients (14). Advantages of this method are associated with no need for losing the integrity of the digestive system, no anastomoses, relatively easy performance and low number of perioperative complications. The high percentage of patients who suffer from vomiting within perioperative period and the uncertain long-term effect in body mass reduction are questionable.

#### SLEEVE GASTRECTOMY – SG

In this procedure, resection of approximately 80-90% of the stomach is performed in order to reduce its volume to ca. 100-150 ml, which leads to a significant limitation in the amount of consumed food and the necessity to change eating habits after surgery. In recent years, the percent share of a sleeve gastrectomy in the general number of bariatric surgeries significantly increased from 0% in 2003 to 27.8% in 2011 (8). At the beginning, this surgery was performed as the first stage of treatment, before more technically difficult procedures, in patients with high BMI and high risk of perioperative complications (15). The results in terms of body mass reduction are satisfactory and in a 12-month follow up, %EWL ranges within 50-60% (16,17). Effects are similar to those achieved in the case of some restrictive and malabsorptive procedures such as Roux-en-Y gastric bypass (18,19). Sleeve gastrectomy beneficially influences the remission of diseases coexisting with obesity (16). Specific complications related to this surgery include leaking within a staple line and stenosis within a created sleeve. The frequency of complications in reports including large groups of patients ranges within 0.6-0.9% in case of stenosis and 2.0-2.2% in case of leaks. Perioperative mortality rate reaches 0.2% (16, 17).

#### MINI GASTRIC BYPASS – MGB

In this surgery, a reservoir is made of the superior part of the stomach using endostaplers. The first stapler is placed at the border between the body and the

antrum of the stomach, in the transverse direction to the long axis of the stomach, and the next ones are along the lesser gastric curvature towards the angle of His. Calibration of the created reservoir takes place with a bougie. Then, an end-to-side anastomosis is performed between the reservoir made of stomach and an intestinal loop, approximately 200 cm behind the ligament of Treitz. In 2011 – 5,250 surgeries of this type were performed, and constituted 1.5% of general number of bariatric surgeries performed all over the world (8). In a group of 1,274 patients who underwent mini gastric bypass, Rutledge obtained the following results: percentage of excess weight loss was 51%, 68% and 77% after 6, 12 and 24 months, respectively. The mean duration of the surgical procedure was  $36.9 \pm 33.5$ , and the shortest procedure lasted 19 minutes. The total rate of complications was 5.2%; frequency of leak was 1.6% and the mortality rate was 0.08% (one case). Complete remission was achieved in the case of hypertension in 90%, diabetes mellitus in 92%, sleep apnea syndrome in 90%, hypercholesterolemia in 93%, and hypertriglyceridemia in 100% of cases (10). The advantages of this method include a relatively low number of complications and permanency in body weight loss in a significant percentage of patients. In a 2012 study describing the results of treatment in 1000 patients, at least 50% of excess weight loss was established in 95% of patients after 18 months following surgery, and similar effect occurred in 89.8% of patients after 60 months (20).

#### ROUN-EN-Y GASTRIC BYPASS – RYGB

Presently, this is the most frequently performed bariatric surgery (7). In 2011, nearly 160,000 procedures were performed all over the world (8). In this procedure, a reservoir is made of the superior part of the stomach with a volume up to 30 ml. Then, an anastomosis is performed between the created reservoir and the alimentary loop measuring 100-200 cm in length, and finally, an intestino-intestinal anastomosis is created between the enzymatic loop and the alimentary loop at a distance of approximately 70 cm from the ligament of Treitz. One of the reasons why Roun-en-Y gastric bypass became so popular was its beneficial influence on the remission of diseases coexisting with obesity, which ranges from 77 to 90% in case of type 2 diabetes mellitus 2, from 68 to 100% in case of dyslipidemia, from 58 to 77% in case of hypertension and approximately 90% in the case of sleep apnea syndrome (21).

#### BILIOPANCREATIC DIVERSION – BPD

This method was proposed in 1979 by Scopinaro (22). In this procedure, a partial gastric resection is performed and a reservoir is created with a volume of approximately 500-700 ml, and then, an anastomosis is performed between the created reservoir and the alimentary loop, which measures approximately 250 cm in length. It may be performed without gastric resection. The anastomosis between the enzymatic loop and the alimentary loop is performed at a distance of

approximately 50 cm before Bauhin's valve. Efficacy of this method in terms of body mass reduction as well as remission of type 2 diabetes mellitus is better than it is in case of banding and Roux-en-Y gastric bypass (23).

#### BILIOPANCREATIC DIVERSION WITH DUODENAL SWITCH – BPD-DS

Among the currently used bariatric procedures, BPD-DS, which connects restrictive and malabsorptive elements, allows achieving the best and at the same time permanent effect in terms of body mass reduction (21). However, mainly due to the highly difficult nature and quite long surgery duration, it is one of the least performed bariatric procedures. In 2011, it constituted only 2.1% of the general number of this type of procedures (8). Restriction is achieved through performing a gastric resection along the lesser gastric curvature, and malabsorption through creating the alimentary and enzymatic loop, and performing an anastomosis between the alimentary loop and the duodenum, as opposed to other malabsorptive procedures with the reservoir made of stomach. It allows avoiding the occurrence of the dumping syndrome and marginal ulcers. Undoubtedly, it is a method that allows achieving a significant percent of body mass reduction. Among the currently performed surgical procedures, it reveals the most beneficial effect on the remission of comorbidities, which in case of type 2 diabetes mellitus reaches 99%, in case of hypertension – 83%, and in case of dyslipidemia – 99% (21). The number of perioperative complications and mortality rate are comparable with other advanced bariatric procedures (24). The efficacy of this method was confirmed in a long-term observation period (25).

#### COMMENTS REGARDING THE EVALUATION OF THE EFFICIENCY IN BODY MASS REDUCTION

According to the standards of the American Society of Bariatric Surgery of 2005, %EWL is one of the criteria for evaluating the efficacy of bariatric procedures. The second criterion taken under consideration should be a change in postoperative BMI. The aforementioned parameters should be evaluated every 3 months within the first year and once a year thereafter (26). Some authors challenge the value of %EWL due to its high variability, mainly because of the lack of precisely defined ideal body weight used for calculation of %EWL as well as the influence of a baseline body mass on the final result (11). Depending on the level of a baseline weight, which is assumed as the basis for calculation, and depending on the definition of a ideal body weight, different values of %EWL are obtained. The study to evaluate the value of %EWL after 12 months following Roun-en-Y gastric bypass and banding placement demonstrated that the percent of excess weight loss ranged from 65 to 82% after RYGB, and from 31 to 46% after banding placement depending on the method used (27). It explicitly indicates that it is necessary to clearly define the manner of calculating body mass reduction parameters in the methodology of work.

## SUMMARY

When selecting a surgical treatment method, one should consider the relationship between the results in terms of permanent weight loss and the percentage of early and late complications related to a given method. The experience of the center in surgical treatment of obesity is also important. An increase in the number of performed surgical procedures is associated with an improvement in achieved results and with a decrease in the number of complications. At least one surgical procedure of the group of restrictive methods, and one procedure of the group of restrictive-malabsorptive methods should be available for the surgeon involved in treatment of obesity. It allows individual matching between the type of surgery and the patient's needs, not only in reference to a baseline body mass, but also in reference to the type of comorbidities as well as the patient's eating habits. The patient's preference regarding the type of procedure is also important. An appropriate preparation of the patient for the surgical procedure, which includes body mass reduction within a preoperative period, is also very important, despite the fact that literature

does not include clear evidence for the beneficial effect of this factor. Extensive diagnostics in terms of internal medicine should be performed in order to exclude such patients from treatment, who demonstrate crucial contraindications. Strict monitoring of the patient after a surgery is also very important. In general, it improves the efficacy of treatment used and it allows avoiding potential complications or diagnosing them early. Presently, a significant part of surgical procedures is performed using the laparoscopic approach. This fact results in a constant increase in the number of performed procedures. In recent years, a tendency to search for new methods is also noticeable in order to limit the extension of interventions. These procedures may include laparoscopic greater curvature plication or transoral vertical gastroplasty. Less invasive procedures may be considered, especially in patients with a lower baseline body mass index. However, the evaluation of suitability of these methods requires conducting further studies. In reporting results of conducted treatment, it is crucial to provide the method of calculation for parameters used in the evaluation of body mass reduction.

## BIBLIOGRAPHY

- Rodriguez-Rodriguez E, Aparicio A, Bermejo LM et al.: Changes in the sensation of hunger and well-being before and after meals in overweight/obese women following two types of hypocaloric diet. *Public Health Nutr* 2009; 12: 44-50.
- Gilhooley CH, Das SK, Golden JK et al.: Food cravings and energy regulation: the characteristics of craved foods and their relationship with eating behaviors and weight change during 6 months of dietary energy restriction. *Int J Obes* 2007; 31: 1849-1858.
- Rosenbaum M, Kissileff HR, Mayer LE et al.: Energy intake in weight-reduced humans. *Brain Res* 2010; 1350: 95-102.
- Dixon JB, Zimmet P, Alberti KG et al.: International Diabetes Federation Taskforce on Epidemiology and Prevention. Bariatric surgery for diabetes: The International Diabetes Federation takes a position. *J Diabetes* 2011; 3: 261-264.
- Schauer PR, Kashyap SR, Wolski K et al.: Bariatric surgery versus intensive medical therapy in obese patients with diabetes. *N Engl J Med* 2012; 366: 1567-1576.
- Mingrone G, Panunzi S, De Gaetano A et al.: Bariatric surgery versus conventional medical therapy for type 2 diabetes. *N Engl J Med* 2012; 366: 1577-1585.
- Ward M, Prachand V: Surgical treatment of obesity. *Gastrointest Endosc* 2009; 70: 985-990.
- Buchwald H, Oien DM: *Metabolic/Bariatric Surgery Worldwide* 2011. *Obes Surg* 2013; 23: 427-436.
- Buchwald H: American Society for Metabolic and Bariatric Surgery (ASMBS) 2004. Consensus Conference. Consensus Conference Statement Bariatric surgery for morbid obesity: Health implications for patients, health professionals, and third-party payers. *Surg Obes Relat Dis* 2005; 1: 371-381.
- Rutledge R: The mini-gastric bypass: experience with the first 1,274 cases. *Obes Surg* 2001; 11: 276-80.
- Nanni G, Familiari P, Mor A et al.: Effectiveness of the Transoral Endoscopic Vertical Gastroplasty (TOGa®): a good balance between weight loss and complications, if compared with gastric bypass and biliopancreatic diversion. *Obes Surg* 2012; 22: 1897-1902.
- Favretti F, Segato G, Ashton D et al.: Laparoscopic adjustable gastric banding in 1,791 consecutive obese patients: 12-year results. *Obes Surg* 2007; 17: 168-175.
- Abdelbaki TN, Huang CK, Ramos A et al.: Gastric plication for morbid obesity: a systematic review. *Obes Surg* 2012; 22: 1633-1639.
- Fried M, Dolezalova K, Buchwald JN, et al.: Laparoscopic greater curvature plication (LGCP) for treatment of morbid obesity in a series of 244 patients. *Obes Surg* 2012; 22: 1298-1307.
- Regan J, Inabnet W, Gagner M.: Early experience with two-stage laparoscopic Roux-en-Y gastric bypass as an alternative in super obese patient. *Obes Surg* 2003; 13: 861-864.
- Brethauer SA, Hammel SA, Schauer PR.: Systematic review of sleeve gastrectomy as staging and primary bariatric procedure. *Surg Obes Relat Dis* 2009; 5: 469-475.
- Gagner M, Deitel M, Kalberer TL et al.: The Second International Consensus Summit for Sleeve Gastrectomy, March 19-21, 2009. *Surg Obes Relat Dis* 2009; 5: 476-485.
- Kehagias I, Karamanakos SN, Argentou M et al.: Randomized clinical trial of laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy for the management of patients with BMI < 50 kg/m<sup>2</sup>. *Obes Surg* 2011; 21: 1650-1656.
- Paluszkiwicz R, Kalinowski P, Wróblewski T et al.: Prospective randomized clinical trial of laparoscopic sleeve gastrectomy versus open Roux-en-Y gastric bypass for the management of patients with morbid obesity. *Wideochir Inne Tech Malo Inwazyjne* 2012; 7: 225-232.
- Noun R, Skaff J, Riachi E et al.: One thousand consecutive mini-gastric bypass short and long-term outcome. *Obes Surg* 2012; 22: 697-703
- Buchwald H, Avidor Y, Braunwald E et al.: Bariatric surgery: a systematic review and meta-analysis. *JAMA* 2004; 292: 1724-1737.

22. Scopinaro N, Gianetta E, Civaleri D, et al.: Bilio-pancreatic bypass for obesity: II. Initial experience in man. *Br J Surg* 1979; 66: 618-620.
23. Buchwald H, Estok R, Fahrbach K, et al.: Weight and type 2 diabetes after bariatric surgery: systematic review and metaanalysis. *Am J Med* 2009; 122: 248-256.
24. Biertho L, Lebel S, Marceau S et al.: Perioperative complications in a consecutive series of 1000 duodenal switches. *Surg Obes Relat Dis*. 2013; 9: 63-68.
25. Pata G, Crea N, Di Betta E et al.: Biliopancreatic diversion with transient gastroplasty and duodenal switch: Long-term results of a multicentric study. *Surgery*. 2013; 153: 413-422.
26. Oria HE, Carrasquilla C, Cunningham P, et al.: Guidelines for weight calculations and follow-up in bariatric surgery. American Society for Bariatric Surgery Standards Committee, 2004-2005. *Surg Obes Relat Dis* 2005; 1: 67-68.
27. Montero PN, Stefanidis D, Norton HJ, et al.: Reported excess weight loss after bariatric surgery could vary significantly depending on calculation method: a plea for standardization. *Surg Obes Relat Dis* 2011; 7: 531-534.

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