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One-anastomosis gastric bypass – own experience

Pętlowe wyłączenie żołądkowo-jelitowe – doświadczenia własne

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Key words

one-anastomosis gastric bypass, efficacy, complications, hospital readmissions

Słowa kluczowe

pętlowe wyłączenie żołądkowo-jelitowe, skuteczność, powikłania, ponowna hospitalizacja

Summary

Introduction. Surgical treatment of obesity enables to obtain a permanent reduction in body weight and promotes resolution of comorbidities of obesity. We continue to seek surgical methods of an advantageous relationship of the obtained benefits and the risks associated with surgery. One-anastomosis gastric bypass is considered one of such methods by some authors.

Aim. The aim of the study was to assess the effectiveness of one-anastomosis gastric bypass within weight loss parameters and the safety of the surgery, as based on own material.

Material and methods. The paper presents an analysis of data collected prospectively from consecutive patients in whom one-anastomosis gastric bypass was performed in the period from November 2010 to May 2014. The efficacy of the one-anastomosis gastric bypass was assessed in terms of weight loss, the rate of hospital readmissions and complications.

Results. One-anastomosis gastric bypass was performed in 39 patients. Mean %EBMIL was $100.2 \pm 33.2\%$ (range: 34.5-207.2), and mean %WL was $29.3 \pm 8.1\%$ (range: 15.3-49). In one case (2.6%), characteristics of dehydration were observed in the postoperative period. In another patient (2.6%), iron deficiency anemia was diagnosed. Marginal ulcers were noted in two cases (5.2%). Excessive weight loss occurred in one patient (2.6%). In 8 cases (20.5%), rehospitalization took place.

Conclusions. One-anastomosis gastric bypass is associated with great efficacy in the reduction of weight and a low rate of early complications. Patients require constant supervision of the team conducting the treatment because of the possibility of the emergence of late complications.

Streszczenie

Wstęp. Chirurgiczne leczenie otyłości pozwala na uzyskanie trwałej redukcji masy ciała oraz sprzyja ustępowaniu schorzeń współistniejących z otyłością. W dalszym ciągu poszukuje się metod operacyjnych o korzystnej relacji uzyskiwanych korzyści do ryzyka związanego z zabiegiem operacyjnym. Za jedną z takich metod część autorów uważa pętlowe wyłączenie żołądkowo-jelitowe.

Cel pracy. Celem pracy była ocena skuteczności pętlowego wyłączenia żołądkowo-jelitowego w zakresie parametrów redukcji masy ciała oraz bezpieczeństwa tej metody operacyjnej na podstawie materiału własnego.

Materiał i metody. W pracy dokonano analizy prospektywnie zbieranych danych kolejnych pacjentów, u których w okresie od listopada 2010 do maja 2014 roku wykonano pętlowe wyłączenie żołądkowo-jelitowe. Oceniono skuteczność pętlowego wyłączenia żołądkowo-jelitowego w zakresie redukcji masy ciała, odsetek ponownych hospitalizacji oraz powikłań.

Wyniki. Pętlowe wyłączenie żołądkowo-jelitowe wykonano u 39 pacjentów. Średni %EBMIL wyniósł $100,2 \pm 33,2\%$ (zakres: 34,5-207,2), a średni %WL $29,3 \pm 8,1\%$ (zakres: 15,3-49). W jednym przypadku (2,6%) wystąpiły cechy odwodnienia w okresie pooperacyjnym. U kolejnej pacjentki (2,6%) stwierdzono niedokrwistość z niedoboru żelaza. W dwóch przypadkach (5,2%) stwierdzono owrzodzenie w zespoleniu żołądkowo-jelitowym. Nadmierna utrata masy ciała wystąpiła u jednego pacjenta (2,6%). W 8 przypadkach (20,5%) doszło do ponownej hospitalizacji.

Wnioski. Pętlowe wyłączenie żołądkowo-jelitowe jest metodą operacyjną związaną z dużą skutecznością w zakresie redukcji masy ciała i niskim odsetkiem powikłań wczesnych. W okresie pooperacyjnym pacjenci wymagają stałego nadzoru zespołu prowadzącego leczenie ze względu na możliwość pojawienia się powikłań odległych.

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INTRODUCTION

Surgical treatment of obesity is an attractive alternative, mainly due to good results in terms of weight loss, positive impact on the resolution of comorbidities and the durability of achieved results (1-3). The most commonly performed surgeries, at the moment, include – Roux-en-Y gastric bypass (RYGB), sleeve gastrectomy (SG) and adjustable gastric banding (AGB) (4). The ideal bariatric surgery should be associated with a small amount of complications, sustained reduction in body weight and a short learning curve. The method should not cause nutritional deficiencies and, in case they occur, treatment should not be burdensome for the patient (5). One of the methods of surgical treatment of obesity, which can satisfy the above conditions is one-anastomosis gastric bypass (OAGS). In English literature, this operation is also called “single-anastomosis gastric bypass” or “mini-gastric bypass” (6-8). It seems that the term “mini-gastric bypass” should be reserved for the original method presented by Rutledge and other terms may be used successfully in the case of later modifications of this procedure (6). The one-anastomosis gastric bypass is an interesting alternative for RYGB due to less complex surgical technique and comparable results.

AIM

The aim of the study was to assess the effectiveness of laparoscopic one-anastomosis gastric bypass within weight loss parameters and the safety of the surgery on the basis of own material.

MATERIAL AND METHODS

The paper presents an analysis of prospectively collected data of patients who underwent one-anastomosis gastric bypass. The study included patients with a minimum of 12 months' follow-up. Surgical treatment qualification included patients with morbid obesity in accordance with generally accepted criteria, i.e. with BMI of 35-39.9 kg/m² and with at least one comorbidity of obesity or with BMI \geq 40 kg/m². The second group consisted of patients with type 2 diabetes and BMI of 30-35 kg/m². In this group of patients, treatment for diabetes was an indication for the one-anastomosis gastric bypass. Patients in whom one-anastomosis gastric bypass was performed as a second step of bariatric treatment, after sleeve gastrectomy, were excluded. The effect of surgery on body weight change was evaluated on the basis of changes in BMI, percent loss of the excess of BMI – %EBMIL and changes in the baseline body weight as a percentage – %WL. The percentage of weight loss shows a change in body weight at a point of observation in relation to the initial weight. Output data from the surgery day was assumed to calculate the parameters of weight reduction in the postoperative period. Normal BMI of 25 kg/m² was assumed to calculate %EBMIL. The number of early complications to the 30th day after surgery, and late ones, after 30 days, was recorded. The rates of re-

hospitalization were recorded and their causes were presented.

Surgical technique

The surgery was performed in the positioning of the patient with joined or abducted lower limbs. In the first case, the operator stood on the right side of the patient and, in the other, between the lower limbs of the patient. The patient positioning depended on the surgeon preference. The surgery was performed laparoscopically using five trocars. Using a linear stapler, a stomach pouch was created with a capacity of 30-50 ml, and a length of about 7-10 cm. The diameter of the pouch produced was calibrated on a 36Fr bougie. Then, using the LigaSure (Covidien) or a harmonic scalpel (Olympus) the greater omentum was cut slightly to the left of the midline. In the case of patients whose morbid obesity was the indication for the surgery, one-anastomosis gastric bypass with a length of 200 cm was performed. In the case of patients whose indication to surgery was type 2 diabetes, one-anastomosis gastric bypasses of 150 cm was performed. Gastrojejunostomy was performed side-to-side using a linear stapler. The stapler defect was closed using Vicryl 3-0 suture. The afferent loop was fixed to the gastric pouch with interrupted sutures so as the top was a few centimeters above the anastomosis. This maneuver is also recommended by some authors in order to reduce the severity of bile reflux in the postoperative period (11, 12). A methylene blue leak test was performed intraoperatively. Suction drain was left in near the anastomosis. A water-soluble contrast examination was performed on the first postoperative day. The drain was removed on the first postoperative day and clear liquids were administered orally. Liquid diet was recommended on the second day and patients were discharged. The first follow-up visit was done after 10 days (with removing sutures) and next follow-ups were encouraged at 1, 3, 6, 9 and 12 months.

RESULTS

In the period from November 2010 to May 2014, one-anastomosis gastric bypass was performed in 39 patients: 27 women and 12 men. In 21 cases, the indication was type 2 diabetes and morbid obesity in the case of 18 patients. The average age of the operated patients was 47.5 \pm 9.5 years (range: 29-64). The average weight before surgery was 103.7 \pm 17.2 kg (range: 78-161) and the mean BMI 36.7 \pm 4.3 kg/m² (range: 29-46). The mean weight 12 months after surgery was 72.3 \pm 11.7 kg (range: 58.5-105) and the mean BMI 25.9 \pm 3.8 kg/m² (range: 20.7-38.1). The mean %EBMIL for the entire operated group was 100.2 \pm 33.2% (range: 34.5-207.2), and the mean %WL was 29.3 \pm 8.1% (range: 15.3-49). The results regarding the parameters of weight loss are shown in table 1. Fourteen patients (35.9%) underwent another operation within the abdominal cavity before the one-anastomosis gastric bypass. Only in one case, it was

abandoned to continue the procedure because of the numerous adhesions in the peritoneal cavity. After a few months, the patient underwent one-anastomosis gastric bypass with open access. Conversion was recorded in one patient, due to intraoperative bleeding. In the case of the remaining 37 (94.8%) patients, the procedure was finished laparoscopically. There was no leakage and no stenosis within the anastomosis. No postoperative bleeding requiring transfusions or revision surgeries was recorded. One patient (2.6%) had the characteristics of dehydration in the postoperative period. Another patient (2.6%) had iron deficiency anemia requiring erythrocyte mass transfusion and intravenous iron supplementation. In two cases (5.2%), during the 12 months follow-up, marginal ulcer was recorded. None of the patients, 12 months after the surgery, reported diarrhea or discomfort associated with bile reflux, even though the symptoms were reported in some patients during the first months of the follow-up. In 8 cases (20.5%), rehospitalization was necessary. Reasons for readmission with the treatment applied for each complication are shown in table 2.

DISCUSSION

More effective, yet less affected by complications, surgical methods for the treatment of obesity are still being searched. One of the surgeries that could meet these expectations is a one-anastomosis gastric bypass. The mini-gastric bypass was for the first time presented in 2001 by Robert Rutledge (5). A variation of the original method was described by Garcia-Caballero and Carbajo (13). That modification was designed to reduce the exposure of the stomach pouch produced and the esophagus to biliary reflux. The main elements of this modification included fixation of the afferent loop

a few centimeters above the anastomosis in order to reduce bile reflux to the stomach pouch prepared and performing anastomosis side to side rather than end to side (13). In subsequent years, this method gained popularity because of the relatively simple technique, a small amount of complications and effective weight reduction and resolution of comorbidities (11, 14-16). One-anastomosis gastric bypass is also used as a method of surgical treatment of diabetes in patients who do not have commonly used indications for bariatric surgery (17). According to some authors, it is a method with a efficacy comparable to the Roux-en-Y gastric bypass, wherein it is related to fewer complications and shorter learning curve (9, 10). The advantages of one-anastomosis gastric bypass also include relatively easy performing revision surgery involving extending or reducing the afferent loop in the event of a weight regain or malnutrition (10, 11, 14, 17-19). One-anastomosis gastric bypass is gaining in popularity despite doubts related to the presence of bile reflux and the lack of long-term follow-up (20, 21). According to data compiled from questionnaires completed by members of IFSO, the number of bariatric procedures performed around the world using this method in 2013 amounted to 8.718, of which 4.000 were performed in France. Unfortunately, in this study, there is no data available on one-anastomosis gastric bypass from the United States and Canada (4). One of the controversy connected with one-anastomosis gastric bypass are the adverse effects of bile on the mucosa of the stomach pouch and the esophagus, which may lead to an increased risk of developing cancer. Some authors are of the opinion that mini-gastric bypass is associated with a higher tension than the Roux-en-Y gastric bypass, and this in turn can promote anasto-

Table 1. Weight loss parameters.

Parameter	Before surgery	12 months after surgery	Change
Body weight, kg	103.7 ± 17.2 (78-161)	72.3 ± 11.7 (58.5-105)	30 ± 10.7 (16.5-61)
BMI, kg/m ²	36.7 ± 4.3 (29-46)	25.9 ± 3.8 (20.7-38.1)	10.9 ± 3.6 (5.9-18)
%WL		29.3 ± 8.1 (15.3-49)	
%EBMIL		100.2 ± 33.2 (34.5-207.2)	

data are presented as mean ± SD (range)

Table 2. Hospital readmissions.

Patient number	Postop. day	Symptoms	Complications	Management
15	42 306	fainting, head injury fainting	not found iron deficiency anemia	conservative blood transfusion, iron supplementation
16	8	fatigue	dehydration	conservative, i.v. fluids
23	122	abdominal pain	not found	conservative
25	350	abdominal pain	marginal ulcer	conservative, proton pump inhibitors
28	67	abdominal pain	marginal ulcer	conservative, proton pump inhibitors
30	288	fatigue	excessive weight loss	conservative, dietary consultation with a registered dietician
34	213	abdominal pain	symptomatic cholelithiasis	laparoscopic cholecystectomy
38	216	abdominal pain	not found	conservative

motric leakages. The enzymatic loop length is 200 cm both in the Rutledge original method and in subsequent modifications. There is a possibility of modifying the length of the bypass, due to the patient's initial BMI (22). In the case of patients with lower BMI or patients whose primary indication for surgery is the treatment of type 2 diabetes, the afferent loop length is 150 cm or less (17). Such a solution was also used in our patients.

The parameters of weight loss

Most papers assumed the loss of excess weight expressed as a percentage – %EWL as the basic parameter for assessing the effectiveness of one-anastomosis gastric bypass – in spite of some disadvantages associated with this parameter which hindering comparison of results. The loss of excess weight after one-anastomosis gastric bypass varies between 55 and 88% at 12 months after the surgery (9, 11, 19, 23). The recently published papers presenting the results of one-anastomosis gastric bypass in large groups of patients report achieving %EWL in the range of 63-84% one year after the surgery (15, 16). Assessment of the effectiveness of bariatric surgeries requires also the very important assessment of the durability of the obtained effect. In the case of one-anastomosis gastric bypass after 5-6 years after the surgery, the mean %EWL varies in the range from 77 to 87% (15, 24). The nadir weight is generally recorded 24 months after the surgery (15, 25). In the case of the assessment of weight loss with the use of %EBMIL, this value, as reported by Bruzzi et al., was $67 \pm 20\%$ one year after the surgery. In the present paper, %EBMIL was at the level of $100.2 \pm 33.2\%$ (range: 34.5-207.2), and the mean %WL was $29.3 \pm 8.1\%$ (range: 15.3-49). After any bariatric surgery, even one-anastomosis gastric bypass, a weight regain can take place. In the case of one-anastomosis gastric bypass, the reason for this may be the gastric pouch dilation. The paper by Bruzzi et al. reports such a situation in 3.2% of patients (25).

Conversion

The percentage of conversion in the course of one-anastomosis gastric bypass is in the range between 0.0 and 1.2% (26). One of the causes of conversion are adhesions after previous surgeries within the abdominal cavity. This applies especially to patients whose previous procedures were performed with open access or patients with a history of inflammatory processes within the peritoneal cavity (25). In the present study, fourteen patients (35.9%) had another surgery within the abdominal cavity performed before the one-anastomosis gastric bypass. In most cases, it was a laparoscopic cholecystectomy. In these patients, there were no adhesions affecting the surgery. Laparoscopic surgery was abandoned only in one case and the procedure was performed at a later date with open access. In another patient, conversion occurred because of bleeding from blood vessels located on the

posterior wall of the stomach, which occurred during the production of pouch.

Rehospitalization

Malabsorptive or mixed procedures are generally associated with a higher rate of readmissions than purely restrictive surgeries. The rate of readmissions after one-anastomosis gastric bypass ranges between 0.0 and 11% (27). In the present study, re-admission occurred in the case of 8 patients (20.5%). The large percentage of readmissions is probably due to the small size of the sample group and the acquisition of experience in the use of this method of surgery. The main symptoms reported by patients included abdominal pain located in the upper abdomen or weakness. In the case of two patients reporting pain, marginal ulcer was found during the endoscopic examination. Another patient exhibited symptomatic cholelithiasis requiring urgent cholecystectomy. In the case of patients reporting weakness, characteristics of dehydration were found in one case, anemia requiring blood transfusion in one case as well, and very rapid weight loss in another, without characteristics of malnutrition in laboratory tests.

Early complications

In the present study, there were no early complications, up to 30 days after the surgery. One-anastomosis gastric bypass is burdened by a low rate of early complications. Mortality after one-anastomosis gastric bypass is in the range of 0.0-0.9% (25-29). The rate of early complications, up to 30 days, is from 2.7 to 6.7%. The rate of leakages, which may affect both the anastomosis and the staple line within the stomach pouch produced in the case of one-anastomosis gastric bypass is at the level of 0.2-1.3% (15, 26). Other early complications observed after one-anastomosis gastric bypass are injuries of the afferent loop, intra-abdominal bleeding or incarceration into trocar location orifice (18, 25).

Late complications

SEVERE BILE REFLUX

In the present study, none of the patients complained of significant pain indicating the presence of bile reflux 12 months after the surgery. According to many bariatric surgeons, the possibility of bile reflux is one of the reasons not in favor of one-anastomosis gastric bypass. But this is not a common complication (14, 24). The most widely used solution in the case of severe bile reflux, is conversion of Roux-en-Y gastric bypass (25). The report by Chevallier et al. recorded the necessity of such conduct in the case of 0.7% of patients (29). In general, the conversion of Roux-en-Y gastric bypass results in complete disappearance of symptoms of bile reflux without any adverse effect on the weight loss parameters (14, 30).

MARGINAL ULCER

Marginal ulcer is one of the most common complications after the surgery proposed by Rutledge (19). In the

case of modifications proposed by other authors, it is also one of the most common complications. The rate of this complication ranges from 0.6 to 5.6% (24, 26, 29). During long follow-up periods, perforation of ulceration and the need for laparotomy for this reason can take place (25). The negative impact of smoking is highlighted on the incidence of this complication and the potential need for life-long PPIs treatments after one-anastomosis gastric bypass (25). In the present study, marginal ulcers occurred in 2 (5.1%) patients. In both cases, the main reported symptom was pain located in the upper abdomen. In our opinion, in the case of pain reported at this location, it is necessary to perform endoscopic examination of the upper gastrointestinal tract to exclude marginal ulcer. In both cases, effective treatment consisted in orally administered proton pump inhibitors. Both patients, during their control gastroscopic examinations, after 4-6 weeks, exhibited healing of ulcers. It seems to be quite important to produce a narrow stomach pouch and use a gastric tube with a diameter of the maximum of 36 Fr. This is conducive to a reduced production of hydrochloric acid in the resulting pouch and ensures obtaining the restrictive nature of the surgery.

IRON DEFICIENCY ANEMIA

Iron deficiency anemia is one of the most common late complication after one-anastomosis gastric bypass (19). The incidence of this complication ranges from 3.2 to 7.6% (15, 19, 24, 25). In the literature, papers can also be found where no such complication was recorded (10, 14). In the study which defines anemia as a hemoglobin level below 13 mg/dl in men and 11.5 mg/dl in women, the proportion of patients with anemia was as high as 26.6%. What is interesting, hemoglobin levels were positively correlated with the diet frequency of high protein, alcoholic drinks, sugar beverages with balanced formula and the implementation of physical activity while the correlation observed in the case of iron supplementation was negative (31). In most cases, oral iron supplementation is sufficient to obtain the correct level of hemoglobin. Sometimes intravenous supplementation is necessary and even erythrocyte mass transfusion. This applies to patients diagnosed with low hemoglobin levels and clinical symptoms associated with microcytic anemia. Such a situation occurred in one of our patients. Because of fainting, she has been twice rehospitalized. During the first hospitalization, two months after the surgery, there were no anomalies in laboratory tests, hemoglobin level was 13.7 g/dl. During subsequent hospitalization, hemoglobin level at admission was 8.8 g/dl and the levels of iron and ferritin was significantly reduced. Deficiencies of vitamin B₁₂, vitamin D and folic acid were also found. After transfusion of 2 units of red blood cells, intravenous supply and oral administration of iron, the general condition improved and morphology normalized. 12 months after the surgery, morphology and serum iron levels were normal, but the patient

still required oral iron supplementation. Given the relatively high percentage of iron deficiency anemia after one-anastomosis gastric bypass, periodic follow-up of morphology and iron levels should be a routine matter.

EXCESSIVE WEIGHT LOSS AND MALNUTRITION

Excessive weight loss relates to 0.1-1.28% of patients after one-anastomosis gastric bypass (26). But there is no clear definition of excessive weight loss after bariatric surgeries. Most of the authors assume EWL above 100% to be the value. Additional uncertainties are related to the lack of a definition of the ideal body weight assumed for the calculation of %EWL. In most cases, in recent years, the weight corresponding to a BMI of 25 kg/m² is used for this purpose. Weight loss below this level, however, is not synonymous with malnutrition. In the case of one of our patients, %EBMIL after 12 months was 207.2% but BMI in the same time, was 20.7 kg/m². This phenomenon is associated with a low initial body mass index in some patients. This applies to patients with an indication for a metabolic surgery being type 2 diabetes and weight reduction in the period of preparation for the surgery. A total of 17 (43.6%) patients in the present study reported EBMIL greater than 100%, even though, in the case of the majority of them the length of bypass was only 150 cm. At the same time, BMI below 18.5 kg/m² was reported in none of these patients. Application of the criteria of excessive loss of body weight based on %EWL or %EBMIL in patients with low baseline weight is rather unjustified. This applies especially to patients with a BMI of 30-34.9 kg/m², in the case of which, diabetes type 2 is the indication for one-anastomosis gastric bypass. In such a case, excessive loss of body weight should be a decrease of BMI of less than 18.5 kg/m², as defined by the WHO. Severe malnutrition after a bariatric surgery can also be defined as achieving %EBMIL > 100% and a decrease in albumin below 3 g/dl (25). Rutledge found excessive weight loss with accompanying malnutrition in 1.1% of patients and the need for performing a revision surgery because of this occurred in 1% of patients (19). In the paper by Bruzzi et al., severe malnutrition in patients with weight loss exceeding 100% EBMIL occurred at a frequency of 1.6% (25). Severe malnutrition is a major cause of qualifications for a revision surgery after one-anastomosis gastric bypass (10, 20). The percentage of revision surgeries after one anastomosis gastric bypass can therefore be higher than in the case of Roux-en-Y gastric bypass (10).

Given all the advantages, one-anastomosis gastric bypass is an attractive alternative to other bariatric procedures of a mixed nature. Doubts about the harmful effects of bile reflux in the case of this procedure require long-term follow-up. In the postoperative period, attention should be paid to symptoms that may suggest the occurrence of such complications as marginal ulcer or iron deficiency anemia and appropriate preventive measures should be undertaken. Qualifying for

one-anastomosis gastric bypass, one should be aware of the possibility of severe bile reflux in the postoperative period. At the moment, however, there is no conclusive evidence to support the thesis of a higher risk of developing cancer of the esophagus or stomach, as compared to the Roux-en-Y gastric bypass in humans.

CONCLUSIONS

One-anastomosis gastric bypass is associated with a low rate of early postoperative complications

and a high efficiency in terms of weight loss. In the postoperative period, patients require constant supervision of a team conducting the treatment because of the possibility of the emergence of such late complications as marginal ulcer, malnutrition or iron deficiency anemia. One-anastomosis gastric bypass can be associated with a high rate of rehospitalization. Past surgical procedures in the abdominal cavity generally are not a contraindication to perform one-anastomosis gastric bypass.

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