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Laparoscopic sleeve gastrectomy in the treatment of obesity – own experience

Laparoskopowa, rękawowa resekcja żołądka w chirurgicznym leczeniu otyłości – doświadczenia własne

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Summary

Introduction. Sleeve gastrectomy has become more and more popular due to a seemingly easy method of performance, good outcomes with regard to body mass reduction and elimination of obesity-related diseases and an acceptable number of complications. The paper presents outcomes of surgical treatment of patients with morbid obesity using laparoscopic sleeve gastrectomy, based on authors' own material.

Material and methods. The analysis included prospectively collected data of subsequent patients operated on between January 2010 and February 2012. Demographic data, parameters of body weight reduction, surgery parameters, complications and resolution of co-morbidities were evaluated.

Results. 95 patients (63 females and 32 males) were operated. The body weight prior to the surgery was 126 ± 19 kg and BMI 44 ± 5 kg/m², whereas one year after the surgery the values were 92 ± 18 kg and 32 ± 5 kg/m², respectively. The percentage of excess weight loss (%EWL) after 12 months was $56 \pm 19\%$. Two serious complications, including 1 (1.1%) leak and 1 (1.1%) stenosis were observed. Complete remission or improvement after the surgery was observed for arterial hypertension in 61 (84.7%) patients, type 2 diabetes in 20 (58.8%) patients, regression of dyslipidaemia in 29 (50%) and of articular complaints in 25 (51%) patients.

Conclusions. Laparoscopic sleeve gastrectomy is effective weight loss procedure in the majority of patients. Sleeve gastrectomy has beneficial effects on the elimination of obesity-related diseases. This surgery is associated with a relatively low number of complications. In the case of serious complications such as a leak or stenosis long-term treatment at hospital is necessary.

Key words: sleeve gastrectomy, obesity, outcomes

Streszczenie

Wstęp. Rękawowa resekcja żołądka zyskuje coraz większą popularność ze względu na pozornie łatwą technikę wykonania, dobre wyniki w zakresie redukcji masy ciała i ustępowania chorób towarzyszących otyłości oraz akceptowalną liczbę powikłań. W pracy przedstawiono wyniki chirurgicznego leczenia pacjentów z otyłością patologiczną z wykorzystaniem laparoskopowej, rękawowej resekcji żołądka na podstawie materiału własnego.

Materiał i metody. Analizie poddano prospektywnie zbierane dane kolejnych pacjentów operowanych w okresie od stycznia 2010 do lutego 2012 roku. Oceniono dane demograficzne, parametry redukcji masy ciała, dane dotyczące operacji, powikłania oraz ustępowania chorób towarzyszących.

Wyniki. Operowano 95 pacjentów (63 kobiety i 32 mężczyzn). Masa ciała przed operacją wynosiła 126 ± 19 kg, BMI 44 ± 5 kg/m², a po roku od operacji odpowiednio 92 ± 18 kg i 32 ± 5 kg/m². Procent utraty nadmiernej masy ciała (%EWL) po 12 miesiącach wyniósł $56 \pm 19\%$. Odnotowano dwa poważne powikłania w tym 1 (1,1%) nieszczelność i 1 (1,1%) zwężenie. Ustąpienie lub poprawę po operacji stwierdzono w przypadku nadciśnienia tętniczego u 61 (84,7%) pacjentów, cukrzycy typu 2 u 20 (58,8%) pacjentów, ustąpienie dyslipidemii u 29 (50%) a dolegliwości stawowych u 25 (51%) pacjentów.

Wnioski. Rękawowa resekcja w okresie roku od operacji jest związana z satysfakcjonującą redukcją masy ciała. Rękawowa resekcja żołądka korzystnie wpływa na ustępowanie chorób towarzyszących otyłości. Operacja ta obarczona jest względnie niską liczbą powikłań. W przypadku wystąpienia poważnych powikłań, takich jak nieszczelność lub zwężenie, konieczne jest długotrwałe leczenie w warunkach szpitalnych.

Słowa kluczowe: rękawowa resekcja żołądka, otyłość, wyniki

INTRODUCTION

Within recent decades the number of patients requiring treatment due to morbid obesity has significantly increased. This phenomenon is accompanied by an increase in the frequency of obesity-associated diseases such as arterial hypertension, type 2 diabetes, dyslipidaemia, circulatory conditions, arthritis. The efficacy of conservative treatment with regard to permanent body weight reduction and elimination of comorbidities is lower than in the case of surgical treatment (1, 2). Among many surgical methods used in surgical treatment of obesity laparoscopic sleeve gastrectomy has become more and more popular (3). At the beginning this surgery used to be performed as the first stage, before surgeries that were technically more difficult, in patients with high BMI and a high risk of perioperative complications (4). At present sleeve gastrectomy is performed at many centres as a single-stage procedure with good outcomes with regard to body weight reduction and elimination of obesity-related diseases (5-8). The aim of the paper was to assess the efficacy and safety of laparoscopic sleeve gastrectomy in the treatment of morbid obesity based on authors' own material.

MATERIAL AND METHODS

The analysis was performed on prospectively collected data of patients operated on at the Department of General, Oncological and Gastrointestinal Surgery between January 2010 and February 2012. The study included patients with a follow-up period of at least 12 months. Demographic parameters, co-morbidities before the surgery, body weight reduction parameters, effects of surgical treatment on resolution or improvement of arterial hypertension, type 2 diabetes, dyslipidaemia and complaints associated with the osteoarticular system were analysed. Patients were considered eligible for surgical treatment based on the criteria that have been generally accepted: BMI > 40 kg/m² or BMI 35-40 kg/m² with at least one coexisting obesity-associated disease, age 18-60 years. After preliminary tests patients were supervised by a dietician in order to reduce body weight prior to the surgery. As part of preparation for the surgery patients were hospitalised at the Department of Family and Internal Medicine CMKP in order to perform expanded internal medicine diagnostics. All patients had a laparoscopic surgery. Pneumoperitoneum at the pressure 12 to 15 mmHg was created using the Veres needle. Five trocars were used as a standard. Using LigaSure (Covidien) or SonoSurg (Olympus) harmonic knife the omentum was dissected from the greater curvature and, if required, all adhesions between the posterior gastric wall and the pancreas were released. ECHELON FLEX (Ethicon Endo-Surgery) or EndoGIA (Covidien) endostaplers were used to divide the stomach, starting the incision 4-6 cm off the pylorus, calibrating the width of a remainder using 36F bougie. The staple line was reinforced with continuous suture. A methylene blue leak test was routinely performed. A Redon drain was left along sta-

pling line. On the first day a radiological follow-up with gastrografen was performed. In case of no leak symptoms and maintained passage to the duodenum a Redon drain was removed and patients were advised to consume fluids. According to the guidelines patients were discharged on the second day after the surgery, when a liquid diet had been started. A schedule of follow-up visits after a surgery included a follow-up visit 10 days after a discharge combined with suture removal, and then follow-up visits every 3 months. In order to evaluate body weight reduction parameters data from the date of admission to the General Surgery Department were considered as baseline. Body weight loss in kilograms, body weight change, BMI and percentage of excess weight loss (%EWL) were calculated. %EWL was calculated using the following formula – %EWL = (baseline body weight-present body weight/baseline body weight-ideal body weight)x100. Regression of comorbidities was evaluated during a follow-up visit 12 months later based on the criteria mentioned below. Type 2 diabetes: regression – normal fasting glycaemia (< 105 mg%), HbA1c levels < 6.5%, no hypoglycaemic medications for at least 3 months, improvement – normal fasting glycaemia (< 105 mg%), HbA1c levels < 6.5%, reduced doses of hypoglycaemic medications, no improvement – abnormal results of any of the test above, or the need to take hypoglycaemic medications at doses as prior to the surgery. Arterial hypertension: regression – systolic pressure < 140 mmHg, diastolic pressure < 90 mmHg during minimum 2 weeks before the visit after 12 months, no antihypertensives + normal pressure during a follow-up visit after 12 months, improvement – systolic pressure < 140 mmHg, diastolic pressure < 90 mmHg during minimum 2 weeks before the visit after 12 months, reduced doses of antihypertensives + normal pressure during a follow-up visit after 12 months, no improvement – systolic pressure ≥ 140 mmHg, diastolic pressure ≥ 90 mmHg or the need to take antihypertensives at doses as prior to the surgery. Dyslipidaemia: regression – normal lipid parameters: total cholesterol < 200 mg%, LDL cholesterol < 135 mg%, HDL cholesterol 42 – 80 mg%, triglycerides 44 – 183 mg%, without lipid-lowering drugs for 30 days prior to the follow-up visit after 12 months, no improvement – the need to take lipid-lowering agents due to persistent lipid disorders during 30 days prior to the follow-up visit after 12 months. Articular pain and complaints: regression – no articular pain or complaints and discontinuation of analgesics, no improvement – persistent complaints or the need to take analgesics due to this condition. In addition, data regarding a surgical procedure, hospitalisation time, readmission to the Department and early (up to 30 days) and late (between 30 days to one year) complications were recorded. Duration of the surgery was calculated starting from placement of the first trocar to placement of the last skin suture, whereas intraoperative blood loss was calculated based on the amount of blood in the suction pump, in millilitres.

RESULTS

Between January 2010 and February 2012 sleeve gastrectomy was performed in 95 patients (63 females, 32 males). The mean age was 43 ± 10 years (range 17-62). The mean body weight prior to the surgery was 126 ± 19 kg (range 82-180), and the mean BMI 44 ± 5 kg/m² (range 34-55). In the preoperative period type 2 diabetes was observed in 34 (38.6%) patients, arterial hypertension in 72 (81.8%), dyslipidaemia in 59 (67%), and joint pain in 46 (52.3%). In the group of patients with type 2 diabetes 11 (32.4%) took only oral hypoglycaemic agents, 4 (11.8%) took insulin, and 19 (55%) took insulin and oral agents. The mean surgery duration was 123 ± 33 minutes (range 60-270). Forty two (44.2%) patients had had another surgery in the abdominal cavity prior to sleeve gastrectomy. In 4 (9.1%) patients in this group during the surgery adhesions that had to be released were observed, what affected the surgery duration. In four (4.2%) cases simultaneous cholecystectomy was performed due to coexisting symptomatic cholecystolithiasis, and in one (1.1%) case reconstruction of diaphragmatic branches due to a large hiatus hernia. The mean blood loss was 55 ± 83 mL (0-450). Conversion was not performed in any case. Two serious complications (2.2%) were observed. In one case (1.1%) it was a leak along the staple line. This complication was observed in a 46-year-old female patient with the baseline BMI of 44.6 kg/m² in whom during a surgery a stapler cut a bougie while the stomach was being cut off in its upper part (the penultimate staple). An intraoperative leak was not observed in this area. As radiological and clinical signs of a leak were present on the first postoperative day and the surgery had an atypical course a decision was made to perform a revision surgery. During relaparotomy the leak site was identified and sutured manually, and the peritoneal cavity was washed and drained. The patient in a good general condition was discharged home on Day 11, without signs of a leak. The patient was readmitted to the Department on Day 71 due to clinical, biochemical and radiological symptoms of a late gastric fistula. The patient had three sessions of endoscopic closure of the fistula with Tissel-Lyo (Baxter) tissue glue with good effects. The patient in a general good condition, without clinical or radiological signs of a leak was discharged home after 148 days of hospitalisation. Until now she has been supervised by the Outpatient Clinic of Surgery, and no signs of the fistula have been observed (1.5 years after the surgery). Another serious complication included a stenosis of a created sleeve observed in a 17-year-old female patient. The gastrografen examination performed on the first day revealed that a contrast agent did not pass to the peripheral part of the stomach. Due to persistent clinical, radiological and endoscopic symptoms of high obstruction on Day 21 after the surgery relaparoscopy was performed and then adhesions in the gastric angle area were released; however, improvement was not observed. The patient was considered eligible for endoscopic steno-

sis dilation. The first session occurred 28 days after sleeve gastrectomy using a balloon with the diameter of 16 mm. On Day 41 after the surgery another session of endoscopic dilation with an 18-mm balloon was performed. The patient without nausea, vomiting, with good tolerance of an oral diet was discharged in a general good condition on Day 45 after the surgery, on Day 4 after the second session. Until now, namely 24 months after the surgery, there have been no clinical symptoms of a stenosis. In 4 (4.4%) patients a surgical wound infection was observed, in 1 (1.1%) case a postoperative hernia and superficial thrombophlebitis (1.1%). None of the patients experienced perioperative haemorrhage requiring blood transfusion or revision surgery. Complications are presented in table 1. The mean hospitalisation time was 6 ± 5 days (range 4-47), patients were discharged on day 3 ± 5 (range 2-45). In 7 (7.7%) cases urgent rehospitalisation was necessary. Reasons for readmission were as follows: acute cholecystitis, vomiting in the postoperative period in two cases, late gastric fistula, wound infection combined with elevated body temperature, fainting due to hypoglycaemia, general malaise. In 88 operated patients body weight reduction parameters were assessed 12 months after the surgery (in the group of 95 patients 5 patients were excluded due to absence at the follow-up visit after 12 months and two patients who became pregnant during the follow-up period). The mean body weight prior to the surgery was 126 ± 19 kg (range 82-180), and BMI 44 ± 5 kg/m² (range 34-55), and one year after the surgery these parameters were 92 ± 18 kg (range 57-142) and 32 ± 5 kg/m² (range 22-42), respectively. The percentage of excess weight loss (%EWL) after 12 months was $56 \pm 19\%$ (range 7-102), and the mean body weight loss in studied patients was 34 ± 12 kg (range 4-64). The results are presented in table 2. Based on the criteria presented above regression of obesity-associated diseases was evaluated, and the following results were obtained: total regression or improvement for: arterial hypertension in 61 (84.7%) patients, type 2 diabetes in 20 (58.8%) patients, regression of dyslipidaemia in 29 (50%) and of articular complaints in 25 (51%) patients. Table 3 presents the effects of the surgery on the regression of comorbidities.

Table 1. Surgical complications.

Patients with 12-month follow-up, n = 90			
major 2 (2.2%)		minor 6 (6.7%)	
early 2 (2.2%)	late	early 4 (4.4%)	late 2 (2.2%)
stricture 1 (1.1%)		wound infection 4 (4.4%)	postoperative hernia 1 (1%)
leak 1 (1.1%)			superficial vein thrombosis 1 (1%)
postoperative bleeding 0 (0%)			
mortality 0 (0%)			

Early complications – 1-30 day; late complications – > 30 day

Table 2. Weight loss data.

	Before surgery mean \pm SD (range)	12 months after surgery mean \pm SD (range)
Body weight (kg)	126 \pm 19 (82-180)	92 \pm 18 (57-142)
BMI (kg/m ²)	44 \pm 5 (34-55)	32 \pm 5 (22-42)
Weight loss (kg)		34 \pm 12 (4-64)
% EWL		56 \pm 19 (7-102)

BMI – body mass index; % EWL – % excess weight loss

Table 3. Co-morbidities resolution or improvement after sleeve gastrectomy.

Co-morbidity	n 88		resolution n (%)	improvement n (%)
	before n (%)	after 12 months n (%)		
Hypertension	72 (81.8)	35 (39.8)	37 (51.4)	24 (33.3)
Type 2 diabetes melitus	34 (38.6)	26 (29.5)	8 (23.5)	12 (35.3)
Joint pain	46 (52.3)	21 (23.9)	25 (51)	–
Hyperlipidemia	59 (67)	30 (34.1)	29 (50)	–

DISCUSSION

Laparoscopic sleeve gastrectomy is currently a renowned method of surgical treatment of obesity. It belongs to a group of restrictive surgeries whose main mechanism of action involves reducing the volume of consumed food. Other suggested mechanisms favouring body weight reduction include lowering the ghrelin level and enhancing gastric passage (8-10). In the majority of centres this surgery is performed via a laparoscopic approach and only in exceptional circumstances is associated with the need of conversion (3, 11). There was no such a case in our experience. Sleeve gastrectomy is effective with regard to body weight reduction. In this work percentage of excess weight loss – %EWL was considered to be an efficacy parameter. In the studied group %EWL 12 months after the surgery was 56 \pm 19%. It is a result comparable to the ones in the literature (3, 6, 11). Some authors report similar or even better effects of sleeve gastrectomy compared to combined procedures such as a gastric bypass (12, 13). In the literature there are reports on the effects of body mass loss during a follow-up period of up to nine years (7, 14). Body weight reduction prior to the surgery has a beneficial effect on the course of a surgery increasing its safety. Body weight gain immediately prior to the surgery appears to be an unfavourable prognostic factor and in general indicates lack of compliance. Currently, if there is body weight gain during the period between qualification and admission to the Department a patient is considered not eligible for surgical treatment. Surgical treatment is aimed not only at body weight reduction but it also affects the regression of such diseases as arterial hypertension, type 2 diabetes, lipid disturbances, sleep apnea, and in the long-term provides prolongation of life expectancy and a reduced risk of cancer. Beneficial effects of sleeve gastrectomy on the regression of comorbidities have

been confirmed in many reports (3, 6, 15-17). In our work resolution or improvement was observed for: arterial hypertension in 61 (84.7%) patients, type 2 diabetes in 20 (58.8%) patients. The regression of dyslipidaemia was observed in 29 (50%), and of articular complaints in 25 (51%) patients. These results are comparable to the ones given in the literature. When reporting the effects of bariatric surgeries on the regression of comorbidities it is essential to precisely define criteria of remission or improvement with regard to a given condition. Sleeve gastrectomy can be associated with specific complications such as: a leak in a staple line, haemorrhage, acute gastroesophageal reflux or a stenosis of a created sleeve. Brethauer et al. in their systematic review of 2367 patients reported the following results: leak – 2.2%, haemorrhage requiring a revision surgery or blood transfusion – 1.2%, stenosis requiring an endoscopic or surgical intervention – 0.6%. In the same study the mortality within 30 days since the surgery was 0.19% (6). In another report based on the analysis of surveys covering 14 776 performed surgeries the incidence of a leak in the upper part of the stomach was – 1.5%, in the peripheral part of the stomach – 0.5%, haemorrhage – 1.1%, stenosis 0.9%, and mortality was 0.2% (3). In the present study complications were evaluated in the group of 90 patients in whom an entire follow-up period of 12 months was completed. Two serious complications (2.2%) were observed. In one case a stenosis of a created sleeve in the gastric angle area was observed. Despite the fact that a stenosis is quite a rare complication in the literature there are reports of different management strategies. Possible solutions include dilation using endoscopic balloons, Heineke-Mikulicz surgery, seromyotomy, placement of a self-expanding stent, conversion to the Roux-en-Y gastric bypass, and gastrectomy in severe cases (18-23). The second serious complication included a leak at the site where a stapler cut a gastric probe used for calibration. In general, a leak is observed in the upper part of the remaining stomach, in the area of the angle of His (22). In some cases leak symptoms appear long time after a surgery (24). Treatment of a leak associated with sleeve gastrectomy is in general difficult and long-lasting. In most cases it is possible to improve the patient's general condition; however, fistula recovery seems to be difficult. In general, management depends on the patient's general condition. The majority of authors recommend appropriate drainage and placement of a self-expanding stent linking the site of a leak (25, 26). Effective leak treatment with pigtail-type drains placed from the inside of the stomach have also been described (27). Manual suture placement appears to be reasonable only in cases of early leaks (28). However, primary sutures are usually not effective (29). In addition, effective treatment of fistulas using tissue glues applied endoscopically has also been described (30). This solution was also used in the case of a late fistula in our patient. Due to lack of efficacy of methods described above more radical strategies such as Roux loop gastric bypass or gastrectomy have to be considered. It seems

that continuous sutures along a staple line have the largest effects on the duration of a surgical procedure. We adopted this solution due to potential, beneficial effects of additional sutures on reducing the number of such complications as leaks or haemorrhage along suture lines. However, not all authors confirm the beneficial effects of this strategy (31). The effects of a learning curve are not without significance. In centres with more experience the duration of a surgical procedure is shorter (32).

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CONCLUSIONS

Sleeve gastrectomy is associated with satisfactory body weight reduction in the majority of operated patients. Sleeve gastrectomy has beneficial effects on the elimination of obesity-related diseases. This surgery is associated with a relatively low number of complications, both early and late. In the case of serious complications such as a leak or stenosis long-term treatment at hospital is usually necessary.

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received/otrzymano: 19.02.2013
accepted/zaakceptowano: 27.03.2013

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