

IX . SUMMARY

Obesity is a chronic disease characterized by abnormal or excessive accumulation of adipose tissue in the body. Obesity does not tend to regress spontaneously, what is more, it is a recurrent disease, leading to the development of many complications, such as type 2 diabetes, atherogenic dyslipidemia, atherosclerosis, hypertension, osteoarthritis, obstructive sleep apnea, non-alcoholic fatty liver disease and many others.

The prevalence of obesity in the world and in Poland is constantly increasing. Studies conducted by Polish Food and Nutrition Institute shows that obesity in Poland in years 2019-2020 (BMI (Body Mass Index) ≥ 30 kg/m²) occurred in 15.2% of women and 15.4% of men, and morbid obesity (BMI ≥ 40 kg /m²) in 0.4% of women and 0.5% of men.

Conservative treatment of morbid obesity, consisting of changing eating habits, increased physical activity and pharmacotherapy, is often unsatisfactory, cause patients reduce only 5-15% of body weight. Bariatric surgery is currently the most effective treatment of morbid obesity.

Sleeve gastrectomy (SG) is the most frequently performed bariatric surgery in Poland, enabling effective weight reduction. However, it should be noted that this is an operation that carries the risk of complications, such as gastric stenosis, gastroesophageal reflux disease or nutrient deficiencies.

The aim of the study was a comparative analysis of the clinical condition of morbidly obese patients before and 1, 3 and 6 months after sleeve gastrectomy to establish nutritional recommendations after bariatric treatment.

The study included 32 people (15 men and 17 women) with morbid obesity who underwent sleeve gastrectomy at the 1st Department of General and Endocrinology Surgery, Medical University of Bialystok, who met the inclusion criteria and at the same time did not meet the exclusion criteria from the study.

The study was divided into four stages: an initial visit the day before surgery and 3 follow-up visits: one month, 3 months and 6 months after surgery. At every stage of the study, the nutritional status, diet, and selected biochemical blood parameters were assessed (total cholesterol, LDL - cholesterol, HDL - cholesterol, triglycerides, fasting glucose and insulin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), C-reactive protein and morphology). The assessment of nutritional status included anthropometric parameters (body weight, height, waist circumference, hip circumference) and body composition analysis using

the bioelectrical impedance method (determined: total body fat content (kg and %), total lean body mass (kg and %) and muscle mass content (kg), total body water content (litres and %) and resting metabolic rate (kcal)). The assessment of the diet (at each visit) was carried out by conducting a 3-day, 24-hour nutritional interview. The energy and nutritional value of the diet was determined using the computer program DIETA 5.0 (Food and Nutrition Institute, Warsaw).

Assessing selected anthropometric and body composition parameters of the study women and men half a year after SG a statistically significant decrease in the median of body weight (women from 122 kg to 91 kg, and men from 150 kg to 106 kg) and the median of BMI (women from 43.7 kg/m² to 32.7 kg/m², and men from 47.3 kg/m² to 34.2 kg/m²) were observed. A significant decrease in body weight and BMI was observed just one month after the procedure. In addition, both groups showed a significant decrease in waist and hip circumference 3 and 6 months after SG. The median waist circumference in the group of women before surgery was 136 cm, after three months was 119 cm and half of year was 108 cm. In the group of men, it was 151 cm, 131 cm and 123 cm, respectively. The median hip circumference in the group of women before surgery was 140 cm, after three months was 125 cm and half of year was 121 cm. In the group of men, it was 126 cm, 118 cm and 110 cm, respectively.

In order to assess the effectiveness of sleeve gastrectomy, three indices were calculated: %TWL, %EWL and %BMIL. Six months after surgery, the median of %TWL in the group of women was 23.5%, the median of %EWL was 49%, and the median of %BMIL was 60.5%. In the group of men half a year after SG, the median of %TWL was 22.5%, the median of %EWL was 47.6%, and the median of %BMIL was 55.4%.

Assessing the results of the body composition analysis in the group of women, a statistically significant decrease in the median body fat mass (from 60.1 kg before surgery to 52.2 kg after one month, to 44.8 kg after 3 months, to 36.2 kg half year after surgery) was demonstrated. Moreover, statistically significant decrease in the median total body water content (from 48.1 litres before surgery to 45.3 litres after one month, to 44.1 litres after 3 months, to 42.2 litres half year after surgery) was observed. In addition, after 3 and 6 months after the surgery, a statistically significant decrease in the median lean body mass (from 58.8 kg before surgery to 53.9 kg after three months, to 52.8 kg half year after surgery) and median muscle mass (from 25.6 kg before surgery to 24.2 kg after three months, to 23.3 kg half year after surgery) was demonstrated. A statistically significant decrease in the median resting metabolic value (from 1684 kcal to 1618 kcal) was found only 6 months after surgery.

In the group of men, a significant decrease in the median body fat content was demonstrated after three (from 69.2 kg to 48.1 kg) and six months (to 37.9 kg) after surgery. Lean body mass and total water content in the body decreased and were statistically significantly different from the values before surgery in each of the assessed periods. The median lean body mass before the surgery was 84.0 kg and decreased to 75.8 kg one month after the SG, and next to 75.3 kg – after three months, to 70.9 kg half year after the SG. The median total water content decrease from 68.0 litres before surgery to 58.7 litres after one month, to 57.9 litres after 3 months, to 55.2 litres half year after surgery. In addition, median muscle mass decrease was observed at each of the post-surgery periods (41.9 kg before, 40.4 kg one month after, 38.2 kg three months after and 37.8 kg half year of surgery). However, the differences were statistically significant only half year after SG. A statistically significant decrease in the median resting energy expenditure was observed after 3 months (from 2345 kcal to 2151 kcal) and 6 months (to 2088 kcal) after SG.

There was a positive relationship between lean body mass and protein and leucine intake after three and six months after SG in the group of men, and also between muscle mass and protein intake six months after surgery in the group of women. In addition, a positive correlation was observed in both study groups between the resting metabolic rate and lean body mass and muscle mass after one, three and six months after surgery.

Assessing the results of selected blood biochemical parameters before and after SG in the group of women, both after 3 and 6- after months from SG a significant reduction in the median fasting glucose concentration, fasting insulin concentration and HOMA-IR index was observed relative to the median before surgery. In the group of men, a significant decrease in the median fasting glucose, insulin levels and the HOMA-IR index compared to their values before the surgery was demonstrated one, three and six months after SG. A significant decrease in median total and LDL-cholesterol concentrations was observed only one month after the surgery, however, after 3 and 6 months, increase of these parameters was observed again. However, after three months and half a year after SG, a significant, positive reduction in the median triglyceride concentration was observed in the group of women. In the group of men, a decrease in the median concentration of triglycerides in the blood was observed one month after the surgery, but it was statistically significant only six months after the SG. In addition, a month after the surgery, a significant decrease in the median HDL-cholesterol was observed in both groups and it increased again three months after the SG. Half a year after surgery, a significant reduction in the median AST concentration was observed in both groups, and in the group of men, additionally, the median ALT concentration. In addition, in

the group of men, a significant decrease in the median CRP concentration was observed after three and six months after SG.

In the next stage of the study, the energy and nutritional value of the diet of study women and men before and after sleeve gastrectomy was analysed. It was found that before the surgery the median energy value in the group of women was 1766.2 kcal per day, and in the group of men 2726.6 kcal per day. The median percentage of protein in the energy value of the diet was 16.8% in the group of women and 19.5% in the group of men. The part of carbohydrates in covering the energy value of the diet in the group of women was 42.9% and in the group of men 41.6% (both it was too low), and the part of fats was unfavourably high and amounted to 37% and 36.5%, respectively. The diet of each group was characterized by too low fibre content (17.2g in the group of women and 19.6g in the group of men). It was also shown that men's diet was deficient of calcium, magnesium, potassium, folate and vitamin D, and in the group of women additionally - iron.

Assessing the diet of women and men one, three and six months after the surgery, a significant decrease in the energy and all assessed nutrients value of the diet was observed. The energy value of the diet, six months after the surgery was between 742.3 - 990.5 kcal/day. Insufficient protein intake (<60g/day) was found in 88.2% of women and 93.3% of men one month after SG, in 82.3% of women and 10% of men after three months, and also in 76.5% of women and 40% of studied men half a year after surgery. One and three months after SG, insufficient carbohydrate intake was demonstrated in 100% of patients. After half a year, this percentage decreased to 76.5% in the group of women and 46.7% in the group of men. Carbohydrate intake one month after the surgery ranged from 32.6 to 37.7 g/d, 3 months after the surgery from 48.4 to 65.4 g/d, and 6 months from 79.7 to 132.7 g. In addition, it was observed that the diet patients after bariatric surgery was particularly deficient in dietary fibre, vitamins (C, B₁, B₁₂, D, E, A and folate) as well as calcium, iron, magnesium, potassium and zinc.

To summarize, sleeve gastrectomy is an effective method of reducing body weight and improving the clinical condition of morbidly obese patients. However, proper nutritional preparation of the patient for surgery should be ensured, as it has been shown that the patients' diet was characterized by too low nutritional value. The diet was deficient in complex carbohydrates, dietary fibre, vitamins and minerals crucial for the proper functioning of the body, which resulted in the deepening of these deficiencies after bariatric treatment of obesity. In addition, patients should be educated on the possibility and pace of expanding the diet after

sleeve gastrectomy, the use of routine mineral-vitamin and protein supplementation, and the necessary long-term changes in lifestyle, including food consumption behaviour.