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Evaluation of the capacity of patients with pathological obesity, in a six-minutes march test, before and after laparoscopic sleeve gastrectomy

Ocena wydolności pacjentów z otyłością patologiczną, w marszowym teście sześciominutowym, przed i po zabiegu chirurgicznym zmniejszenia żołądka metodą laparoskopową

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Abstract

The aim of a study: The aim of the study was to assess the efficiency of patients with pathological obesity after laparoscopy sleeve gastrectomy in a six-minute march test.

Material and methods: The study was conducted on a group of 30 patients with giant obesity hospitalized in the Surgery Clinic of the 10th Military Research Hospital and Polyclinic in Bydgoszcz. The patient was evaluated on the day before the laparoscopic gastrectomy and one month after the surgery. In all patients a six-minute march test was performed and the author's questionnaire was used.

Results: As a result of the operation, an average weight loss of 10 kg was observed in the patients, an improvement in efficiency, as well as the resignation or significant reduction in symptoms of coexisting diseases. Based on a 6-minute march test it was found that the distance covered by the patients increased by 30 m.

Conclusions: 1. Bariatric surgeries are an effective method of weight reduction for patients with massive obesity. 2. As a result of the procedure, the number of ailments complained about by the patients has decreased. 3. The weight reduction in obese people as a result of a bariatric procedure, increases the functional ability to walk, assessed with a 6-minute march test. 4. The 6-minute march test provides useful information on the functional status of obese patients undergoing bariatric surgery. It is a simple, safe and efficient method for assessing the performance of patients with severe obesity.

Key words: obesity, laparoscopic sleeve gastrectomy, 6-minute march test

Introduction

Today, pathological obesity has taken on epidemic proportions and is considered to be one of the diseases of civilization of global scale [1]. At present in the world over two billion residents are overweight. Three hundred thousand people die every year as a result of complications connected with the obesity, which means that this disease is the second cause of death in the world after smoking. Obesity is a state of pathological increase in the proportion of fat tissue in the human body. It leads to damage of the function and structure of individual organs or systems, biochemical and physiological disorders of the body, as well as sociological and psychological problems. The above consequences of obesity may result in a reduction of the expected survival time [2,3]. It should be noted that even if the body of a patient with an increased amount of adipose tissue in the initial stage does not show pathological symptoms, over time disease threatens to develop damage to the patient's internal organs [4].

Modern civilization development, and with it the change in the way of life, contributes to a drastic reduction in physical activity, which, combined with a high-energy diet, seems to be the fundamental factors causing the occurrence of obesity, thus anticipating environmental and genetic factors. In view of the adverse health of an excessive increase in body fat, there is a need to take measures to normalise body weight in as many people as possible [5,6].

Obesity treatment

Treatment of obesity should be adapted individually to needs of every patient, his age ,gender, degree and type of disease and metabolic risk factors. In the case of this disease, we absolutely must remember about accompanying illnesses. The model of acting at the excess weight and the obesity is covering three stages: 1. non-pharmacological treatment (diet, physical activity and lifestyle modification), 2. pharmacological treatment, 3. surgical treatment [7, 8].

Surgical treatment of obesity

The National Institutes of Health Consensus Conference recommended surgical treatment for appropriately selected patients, due to unsatisfactory weight loss and high rates of relapse after conservative treatment of giant obesity in 1991 [1]. At present bariatric treatments are performed with small-invasive techniques and provide better comfort for patients, and complications concerning wounds aren't already so frequent [9,10].

The basic indications for the surgical treatment of obesity are:

a) BMI >40 kg/m²,
b) BMI >35 kg/m² in situations when obesity is the cause of other accompanying diseases and permanent loss of the body will result in the improvement of the patient's condition or the elimination of the coexisting diseases such as: type 2 diabetes mellitus, arterial hypertension, arthritis, cardiovascular diseases, psychological problems
c) BMI >30 kg/m² with diabetes which cannot be stabilised despite intensive conservative and pharmacological treatment [11,12,13].

Over the years, many surgical techniques have been developed, which found application in pathological obesity treatment. Nowadays, numerous techniques of surgical treatment of pathological obesity are available in bariatric surgery, which based on the mechanism of action were divided:

a) restrictive methods - consisting in limiting the volume of meals taken,
b) excluding methods - which reduces the absorption from the digestive tract,
c) restrictive - excluding - combining those two methods [14, 15].
d)

Laparoscopic sleeve gastrectomy

Sleeve gastrectomy is one of the basic restrictive bariatric operations for the treatment of obesity (ryc.1). This procedure is usually performed using the laparoscopic method. Thanks to this method, patients regain full professional activity faster and the time of hospitalization is significantly shortened [16]. The aim of the operation is to remove the fundus ventriculi and about 80% of the corpus ventriculi, located from the side of the curvatura major ventriculi. After the resection procedure remains , a small, approximately 100 - 150 ml, sleeve-shaped gastric tank and an intact pylorus, which regulates the emptying of gastric contents into the intestine, as a result of which the correct stomach function is maintained. The effect of the operation is reduction of the amount of food consumed and decreasing the feeling of hunger by decrease in the secretion of ghrelin (a hormone that can makes a patient feel hungry) [17]. Sleeve gastrectomy is an irreversible process.

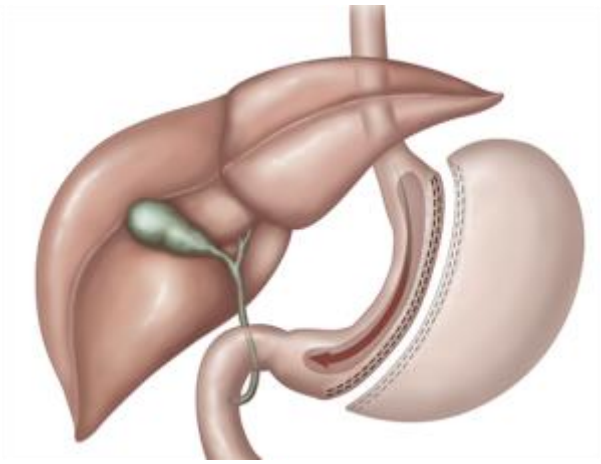

Fig.1. Sleeve gastrectomy [18]

The aim of a study

The aim of the study was to assess the performance of patients with pathological obesity, in a 6-minute march test, before and after laparoscopic gastric sleeve resection. The data obtained helped to determine the efficacy of the treatment of obesity of the giant obesity using the chosen method of surgical treatment.

Material and methods

The study was conducted on a group of 30 patients with giant obesity hospitalized in the Surgery Clinic of the 10th Military Research Hospital and Polyclinic in Bydgoszcz. The study involved 6 men and 24 women, aged 24 to 68 (average 39.8 years). The patient was evaluated on the day before the laparoscopic gastrectomy (study 01) and one month after the surgery (study 02). In all patients a 6-minute march test was performed and the author's questionnaire was used. The questionnaire took into account: patient's age, gender, place of residence, weight, BMI, size of the waist circumference, covered distance during six minutes, and other pathological complaints. The research was approved by the Bioethics Committee of Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Toruń No 113/2018.

Results

6 men and 24 women, aged 24 to 68 (average 39,8 years), participated in the study. The respondents were divided into three age groups: up to 35, 36-45 and over 45. The most numerous group were the respondents aged 36-45 years - 14 people (46.7%), while the smallest number of people was in the group over 45 years old - 6 people (20.0%) (tab.II).

Table II. Age groups of respondents

Age	Number of people	%
up to 35 years	10	33,3
36-45 years old	14	46,7
over 45 years old	6	20,0
Total	30	100,0

The average weight before surgery for all patients was - 117.1 kg (the standard deviation was over 17.1% of the average value, which indicates an average weight variation). Minimum result - 86 kg, maximum result - 161 kg. After the procedure, the average weight for all patients was - 104.6 kg (the standard deviation was more than 17.4% of the average value, which indicates an average weight variation). The smallest recorded weight after the procedure was 77 kg, while the largest was 148 kg. The difference between the average weight of the examined population before and after surgery was 12.5 kg (fig.2).

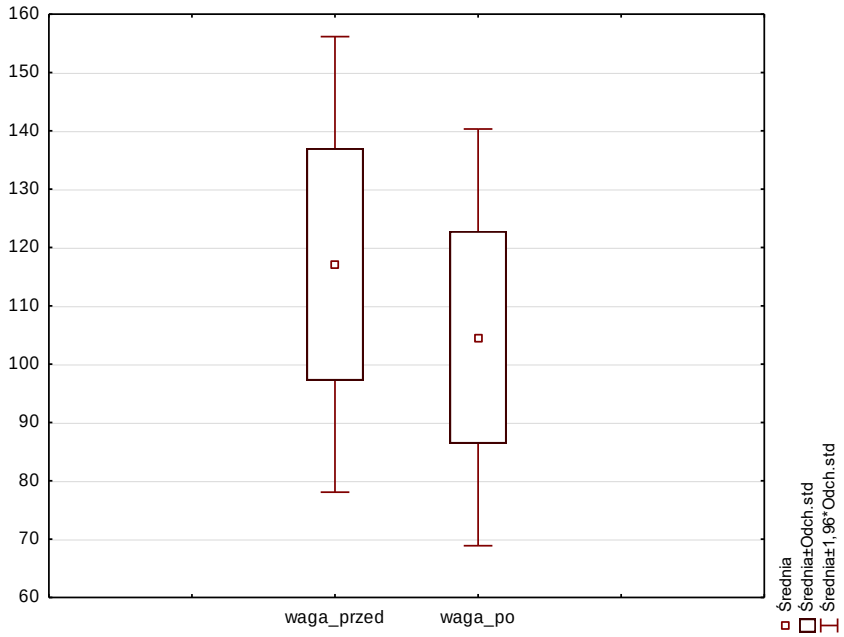

Fig. 2. Distribution of average weight before and after surgery

The influence of the bariatric procedure on the waist circumference of operated patients was also analysed. The average waist circumference dimension before surgery for all patients was 125.53 cm (the standard deviation was over 96.1% of the average value, which indicates a very large variation in results), minimum score was 100 cm and maximum score 150 cm. After the procedure, the average waist circumference for all patients was - 114.73 cm (the standard deviation was over 95.8% of the average value, which indicates a very large variation in results) where the minimum result was 94 cm and maximum was 142 cm. The difference between the average waist circumference dimension between the study 01 and 02 was 10.8 cm (fig.3).

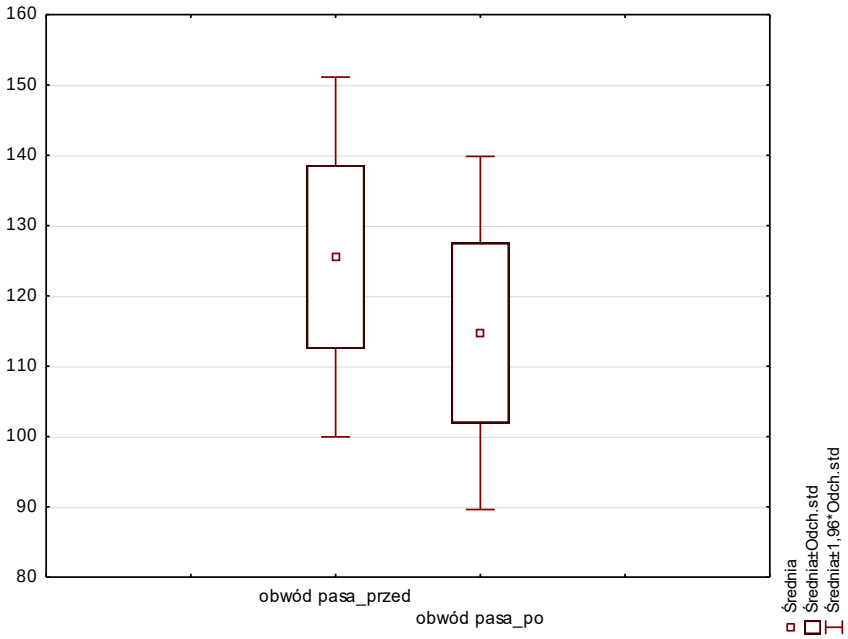

Fig. 3. Distribution of average waist circumference before and after surgery

The distribution of mean BMI values between the study 01 and 02 is shown in Figure 4. The average BMI before surgery for all patients was 40.63, which corresponds to the 3rd degree of obesity (the standard deviation was more than 12.2% of the average value, which indicates small variations in results). The lowest BMI value before the procedure was 32.32, while the highest was 55.06. After the procedure, the average BMI for all patients was 36.28, which corresponds to the first degree of obesity (the standard deviation was more than 12.5% of the average value, which indicates small variations in results. The lowest value of BMI after the procedure was 28.65, while the highest was 50.61. The difference between the average BMI before and after surgery was 4.35 (ryc.4).

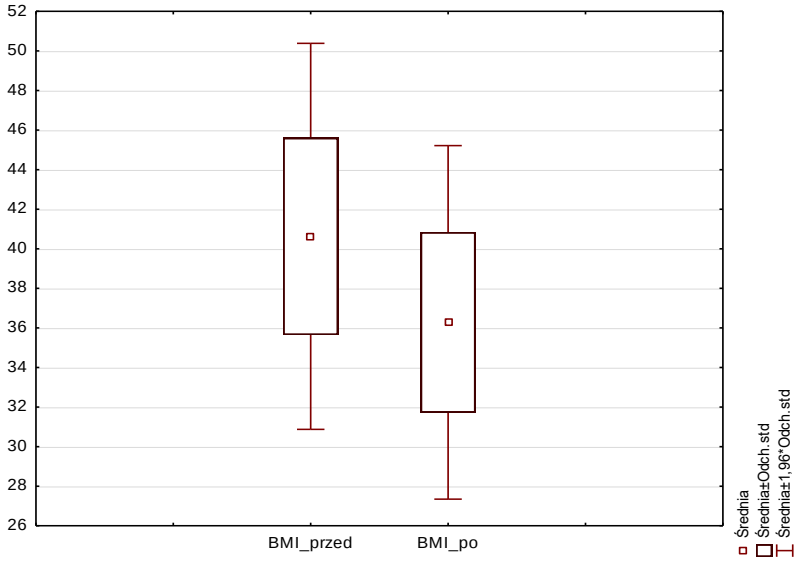

Fig. 4. Distribution of average BMI before and after surgery

In the study group, the distance covered by the patients, both before and after the bariatric procedure, was assessed using a 6-minute march test. The average distance before surgery for all patients was - 374.33 m (the standard deviation was more than 16.8% of the average value, which indicates an average variation of the distance covered). The shortest distance covered in 6 minutes was 180 m, the longest - 500 m. After the procedure, the average distance covered for all patients was - 410 m (the standard deviation was more than 16.3% of the average value, which indicates an average variation of the distance covered). The minimum and maximum result was 210 m and 530 m. The difference between the average distance covered between the study 01 and 02 was 35.67 m (fig.5).

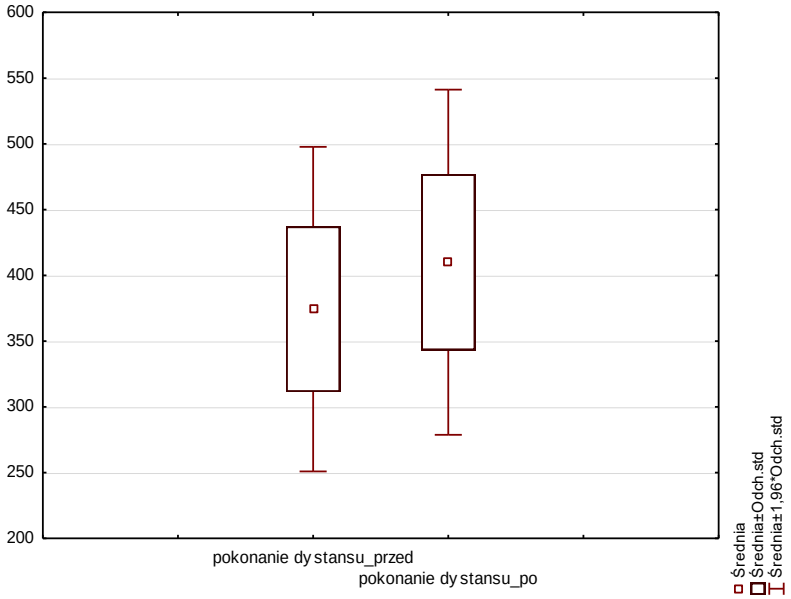

Fig. 5. Distribution of the average 6-minute test before and after surgery

Before the procedure, the highest average distance covered in 6 minutes was noted in the group with the second degree of the obesity - 381.82 m, the lowest in the group with the first degree of the obesity - 340.0 m. The difference is 41.82 m. After the procedure, the highest average distance covered was noted in the group with the second degree of the obesity - 429.17 m, further in the group with the first degree of the obesity- 407.5 m. The shortest distance travelled was for patients with the 3rd degree of the obesity - 372.5 m (tab. II).

Table II. Average results of the 6-minute test in BMI groups

BMI index	**Before the procedure**		**After the procedure**	
	Average 6-minute test	SD	Average 6-minute test	SD
Overweight			385,00	7,07
First degree of the obesity	340,00	34,64	407,50	47,12
Second degree of the obesity	381,82	51,54	429,17	79,25
Third degree of the obesity	375,63	73,84	372,50	91,42

Before the bariatric surgery, most of the patients complained about additional ailments. A total of 40 disease units were recorded. The highest incidence of hypertension was in 15 people, which constituted 37.5% of all diseases. Next, the patients listed diabetes - 11 people (27.5%), hypothyroidism - 5 people (12.5%), spinal pains - 4 people (10%) and leg swelling - 2 people (5%). Asthma, lower limb varicose veins and urethral fossa were the least frequent - 1 person each (2.5%) (Fig. 6). One coexisting disease was indicated by 14 people, two diseases by 7 people and three diseases by 4 people (fig. 6).

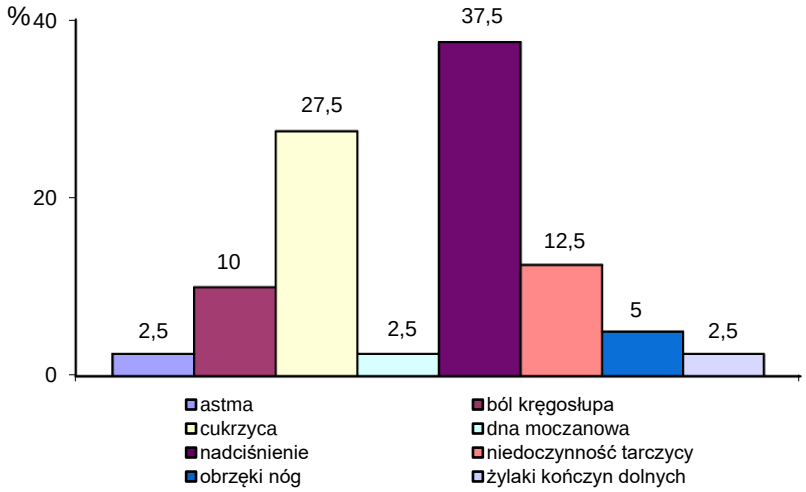

Fig. 6. Distribution of ailments before the procedure

After the procedure, only 9 people complained about the ailments. A total of 13 disease units were recorded. The highest number of respondents indicated a decrease in the number of diabetic drugs - 5 persons, which was 38.5% of all marked responses. Before the procedure, 11 people indicated diabetes. Hypertension remained in case of 5 people, 3 of them indicated decrease of hypertension drugs. The incidence of one coexisting disease was reported by 9 people, two diseases by 2 people (fig. 7).

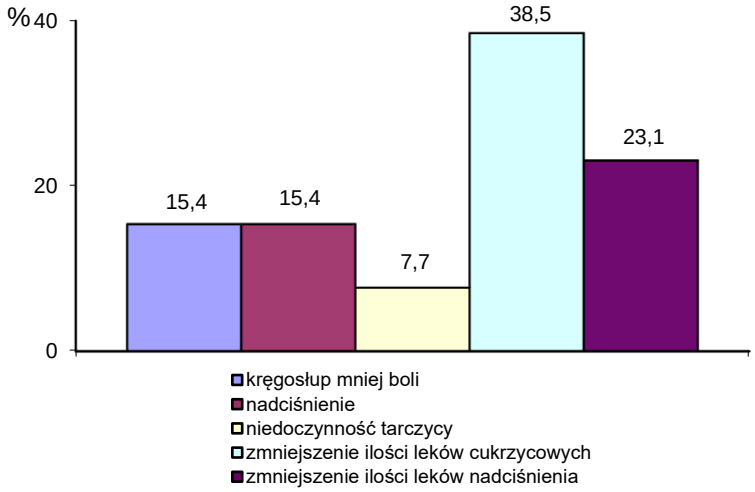

Fig. 7. Distribution of ailments after surgery

Discussion

The study involved 30 people hospitalized in the Surgery Clinic of the 10th Military Clinical Hospital in Bydgoszcz. Women constituted the majority of this group because as much as 80% of the respondents. This tendency to the numerical predominance of women undergoing bariatric procedures is also noted in the studies of other authors [19,20,21,22].

The heaviest patient under surgery was a person weighing 161 kg, whose weight decreased by 13 kg one month after surgery, while the lightest patient was a person weighing 86 kg, whose weight decreased by 9 kg after surgery. The above data suggest that performing bariatric procedures significantly reduces the patients' body weight, which is consistent with the results of other authors' research [19,20,21]. According to various medical sources, patients after laparoscopic gastric cuff resection have a 33% to 45% weight loss within a year after surgery [23].

The mean value of the waist circumference both before and after the procedure was performed was determined in our study. A significant average decrease of this parameter of 10.8 cm was observed. The decrease in the waist circumference value was one of the results obtained by Carrasco F. et al. [21].

According to the literature data, the value of BMI decreased in patients who underwent bariatric surgery [19,22,24,25]. In our own material, the average BMI for all patients before bariatric surgery was 40.63, which corresponded to the third degree of obesity, while one month after the operation it was 36.28, which corresponded to the first degree of obesity.

The research carried out has unequivocally shown that weight loss translates into a longer 6-minute march, which is confirmed by the works of numerous authors [20,24,25,26,27]. Before the procedure, the highest average distance covered was recorded in the group with the second degree of the obesity 381.82 m, the lowest in the group with the first degree of the obesity - 340 m. The average distance covered for all patients was 374.33 m, the minimum result was 180 m, maximum 500 m. After the procedure, the highest average distance covered was recorded in the group with the second degree of obesity - 429.17 m, in the group with the first degree of obesity - 407.5 m, and the lowest in the group with the third degree of obesity - 372 m. After the procedure, the average distance covered for all patients was 410 m, the minimum result was 210 m and the maximum was 530 m. The data obtained suggest that weight reduction in obese people increases their functional ability to walk.

Before the procedure, most of the patients complained about the following diseases associated with obesity. After the operation, the number of patients who reported additional ailments decreased. According to recent literature, the benefits of bariatric procedures include not only weight loss, but also the reduction of the consequences of obesity such as hypertension, diabetes, back pain, heart failure and sleep apnea syndrome [13,22,26,28].

Conclusions

1. Bariatric surgeries are an effective method of weight reduction for patients with massive obesity.
2. As a result of the procedure, the number of ailments complained about by the patients has decreased.
3. The weight reduction in obese people as a result of a bariatric procedure, increases the functional ability to walk, assessed with a 6-minute march test.
4. The 6-minute march test provides useful information on the functional status of obese patients undergoing bariatric surgery. It is a simple, safe and efficient method for assessing the performance of patients with severe obesity.

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