Efficacy of Aerobic Training Program on Weight Reduction after Gastroplasty in Female

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ABSTRACT

The aim of the current study was to investigate the efficacy of aerobic training program on weight reduction after gastroplasty in female. Forty obese female were included in the present study, their age ranged from 25 to 45 years old. They were classified randomly into two groups of equal number. Group (A) composed of 20 morbid obese female patients (Experimental Group) who had undergone Vertical Banded Gastroplasty (VBG) and who received Aerobic training program and group (B) composed of 20 obese patients (Control Group) had undergone VBG only. Assessment was done through determination of body mass index (BMI), serum cholesterol and triglycerides level after six weeks postoperative (pre- exercise) and at six months postoperative. The physical therapy program began, six weeks post operative for experimental group. It Included aerobic exercises performed on the stationary bicycle, for 40 min, three sessions per week for six months. Results showed a statistically significant decrease in BMI, total serum cholesterol and triglycerides in both groups, with a significantly higher level of reduction in experimental group. Conclusion, these results suggested that aerobic training program had a significant effect on weight reduction after Vertical Banded Gastroplasty than VBG only.

INTRODUCTION

Obesity is strictly defined as an excessive accumulation of body fat. The BMI has become the most commonly accepted measurement. A BMI exceeding 25 is considered overweight, while obesity is defined as a BMI of 30 or more. A BMI of 35 or more with serious morbid condition, or BMI of 40 or more, is considered morbid obesity[1].

Obesity is an increasingly significant health problem. Over 4 decades, the prevalence of obesity (BMI 30 Kg/m^2) has increased from 13% to 31% in adults concurrent increases occurred in adolescents and children. Obesity is especially common in developed country[2].

Severe obesity is associated with a large number of problems that gave rise to the term morbid obesity[3].

Weight management means the adoption of healthfull and sustainable eating and exercise behaviors indicated for disease risk and improved feelings of energy and well-being[4].

On the other hand, surgery is considered the treatment of choice for well informed and well motivated severely obese (BMI 40 or 35 with comorbidities). Typically, people who seek surgery have exhausted the more conservative weight less options without satisfactory results. Surgical treatment of obesity is based on two techniques gastric – restricting technique (gastric band, stapling, and ballon) and gastric restricting and malabsorptive technique (Gastric hypass)[5].

Furthermore, vertical banded gastroplasty is an excellent procedure that will provide as much weight control as needed to correct or prevent most complications of obesity, provided that the patient makes more effort to understand the operation and work with it. Most patients are able to eat all types of food without vomiting, provided the food is well chewed and the pouch is not forcefully overfilled[6].

Fortunately, physical activity has been shown to aid in the prevention, maintenance and treatment of obesity through increased energy expenditure[7].

Therefore exercise produces improvements in plasma lipid profiles, insulin sensitivity, Blood pressure and mode[8].

Furthermore there are a contradicting opinions about the role of well organized program of aerobic training after gastroplasty in female[9]. This program might help surgeon, physician, and physical therapists in planning a protocol to enhance the processes of weight reduction after this operation. So the aim of the current study was to investigate the efficacy of aerobic training program on weight reduction after gastroplasty in female.

MATERIAL AND METHODS

Subjects

Forty female patients who underwent vertical banded gastroplasty (VBG) open procedures, were included in the study, they were selected from Educational Ahmed Maher Hospital. The study procedures were conducted in Faculty of physical therapy "out clinic". These subjects were divided randomly into two groups of equal number, the subjects had the following criteria:

- Their ages were ranged from 25 to 45 years old.
- They had a body mass index (BMI) of more than 40 (morbid obesity).
- They no any neurological or orthopedic disorders in lower limb which might interfere with program of the study.
- They recieved the same surgical technique done by the same surgeon.
- All patients were instructed to maintain their diet in a range of 1200 K cal/ day" patients were received an organized program of diet from the first day of the study".
- Subjects were divided randomly into two groups of equal number:

Group 1 (Experimental Group): Twenty patients who received aerobic training program following gastroplasty for 6 months (3 sessions per week).

Group 2 (Control group): Twenty patients who underwent gastroplasty only.

Equipment

A) Assessment Equipment:

- Height and weight scale (floor type model ZT-120, made in China) is used to measure the height and the weight in order to calculate the body mass index of each subject, BMI=Weight (Kg)\ Height (m2)10.
- Photometer (PLD 951, made in Italy) for estimation of serum Cholestrol and Triglycerides.
- Automatic pipettes (Scorex, Made in Switzerland).
- Kits: supplied by human company, Made in Germany.
- Pulsometer: (Tunturt TPN-400, made in Japan), it was used to detect pulse rate during the exercise.

B) Training Equipment:

- Electronic bicycle ergometer (UNIVERSAL, made in New York, USA) equipped with pedals, electronic break,

adjustable seat, handle bar, display screen and foot straps also provided with programmable control unit.

Procedures of the study

[A] Measurement procedures:

1- Initial Evaluation Procedures:

- Before starting the study, a consent form was signed from each participant as an agreement to be involved in the present study, also before initiation of exercise training program. Each subject was examined medically in order to exclude any disorders which might affect the program of the study.
- The purpose of training program was explained for each subject.

- Measurement of Height and Weight:

Weight was determined, height was measured, then the body mass index was calculated where: Body mass index (BMI) = body weight (Kg)/ height (m)[2,11].

- Estimation of Lipid Profile:

- After fasting for at least 12 hours, three mL venous blood was extracted from dorsal hand vein and allowed to clot at 37oC in the water bath, then serum was separated using a centrifuge for estimation of serum triglycerides and cholesterol level.
- Assessment procedure was performed pre-treatment and after six months of treatment.

[B] Therapeutic procedures:

Gradual walking up to one mile per day was started from first day postoperative. Patients was instructed to wear an abdominal binder during ADL for 1 week.The patients were instructed to avoid heavy lifting for three to six weeks after surgery to allow the incisions to heal solidly. The patient might return to work one week after surgery if she underwent a laparoscopic procedure. If the patient underwent an open procedure, she might be able to return to work approximately six weeks later[12]. Exercises performed on the electronic bicycle ergometer (for 40 minutes), as the following stages:

First stage (warming up):

Consisted of five minutes warming up in the form of pedaling at speed of 60 revolution per min without load.

Second stage (active stage):

- Duration: 30 minutes.
- Mode: pedaling at speed of 60 revolution per min.
- Load: adjusted load to achieve 60% of the predictive age maximal heart rate which was calculated by the following equation:

Maximal heart rate = 220-age in years

Moderate work load = 60% of maximal heart rate

The heart rate was measured through pulsometer attached to the patient's ear.

Third stage (cooling down):

Consisted of 5 minutes cooling down in the form of pedaling at speed of 60 revolution per min without load[13].

Duration and frequency:

Three sessions per week for six months post operatively was began after discharge[14].

(C) Data analysis:

Data were collected two times, at six weeks post-operative (pre -value) and at six months post operative (post value). The mean, standard deviation and standard error were calculated for all variables in both groups. Paired "T" test was used also to compare between before and after treatment in the same groups of individuals. Comparison was applied by student t test to compare between two independent means. A value of $P \leq 0.05$ was considered statistically significant.

RESULTS

Statistical analysis of data by using analysis of variance was performed to detect the significance level, mean and standard deviation for the effect of gastroplasty only and aerobics after gastroplasty on BMI, serum cholesterol and triglycerides of these subjects.

Table (1) and Fig. (1) show comparison between pre and post values of BMI in each group. As regards data presented in table (1) show that the post value of body mass index was lower than their corresponding pre values in both groups; it is worth mention that the BMI post values were 39.26% lower than that of pre values in G_1 and 17.21 % lower than that of pre values in G_2.

Table (1): BMI (pre and post values) in each group.

Item	Groups			
	Gastroplasty+ aerobics Group (1)		Gastroplasty Group (2)	
	Pre	Post	Pre	Post
Mean	54.38	33.03	54.22	44.89
S.D	5.04	3.4	4.98	4.2
M.D	21.35		9.33	
Improvement %	39.26%		17.21%	
t- Value	49.83		34.09	
P-Value	<0.0001		<0.0001	
Significance	Significant		Significant	

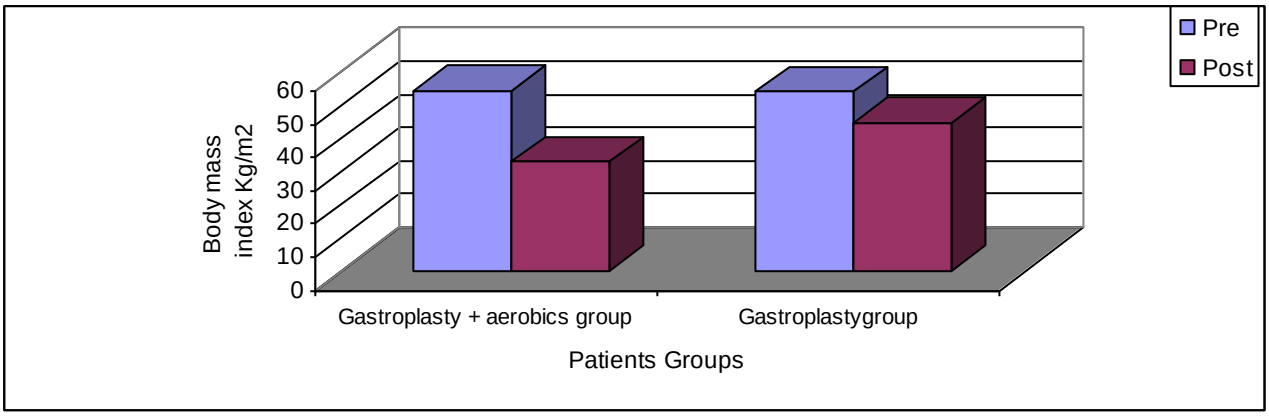

Fig. (1): Pre and post values of body mass index of both groups.

Table (2) and Fig. (2) show comparison between pre and post values of Triglycerides in each group. Table (2) denotes that the (gastroplasty + aerobics) have a significant effect on triglycerides; the post values of triglycerides were 64.63% of the pre value., further more, the T.G. were decreased by 21.05% in the gastroplasty group.

Table (2): Triglycerides (pre and post values) in each group.

Item	Groups			
	Gastroplasty+ aerobics Group (1)		Gastroplasty Group (2)	
	Pre	Post	Pre	Post
Mean	165.4	106.9	167.9	132.55
S.D	12.15	15.24	10.86	6.09
M.D	58.5		35.35	
Improvement %	35.37%		21.05%	
t- Value	29.71		23.74	
P- Value	<0.0001		<0.0001	
Significance	Significant		Significant	

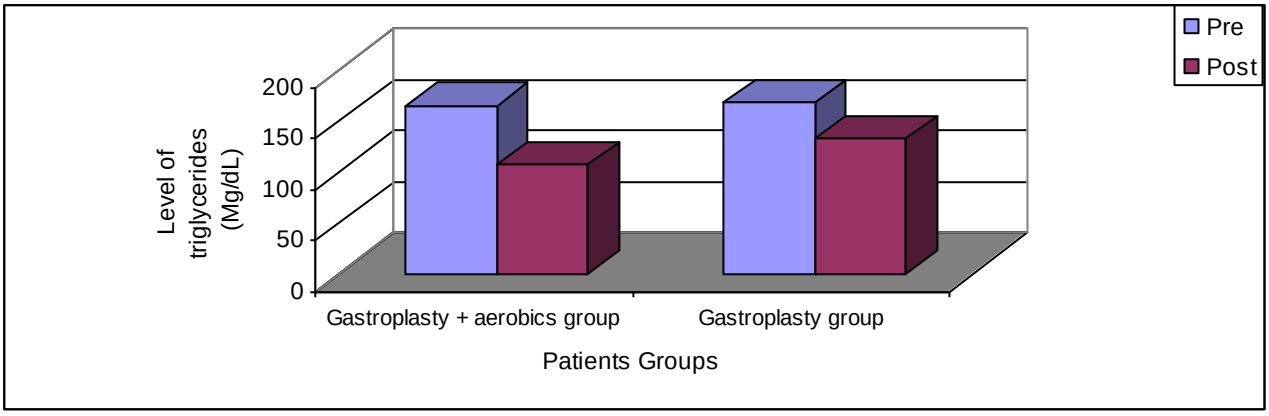

Fig. (2): Pre and post values of triglycerides of both groups.

Table (3) and Fig. (3) show comparison between pre and post values of total cholestrerol in each group. Table (3) identifies a significant decreasing effect of gastroplasty + aerobics on total cholesterol. The post value of cholesterol was lower than the respective pre values by 22.26%, also there was a significant decrement effect of gastroplasty only on total cholesterol which was decreased by 11.42% in G_2.

Table (3): Cholesterol (pre and post values) in each group.

Item	Groups			
	Gastroplasty+ aerobics Group (1)		Gastroplasty Group (2)	
	Pre	Post	Pre	Post
Mean	251.35	195.4	256.25	227
S.D	16.69	29.61	19.93	14.31
M.D	55.95		29.25	
Improvement %	22.26%		11.42%	
t- Value.	9.26		14.06	
P- Value	<0.0001		<0.0001	
Significance	Significant		Significant	

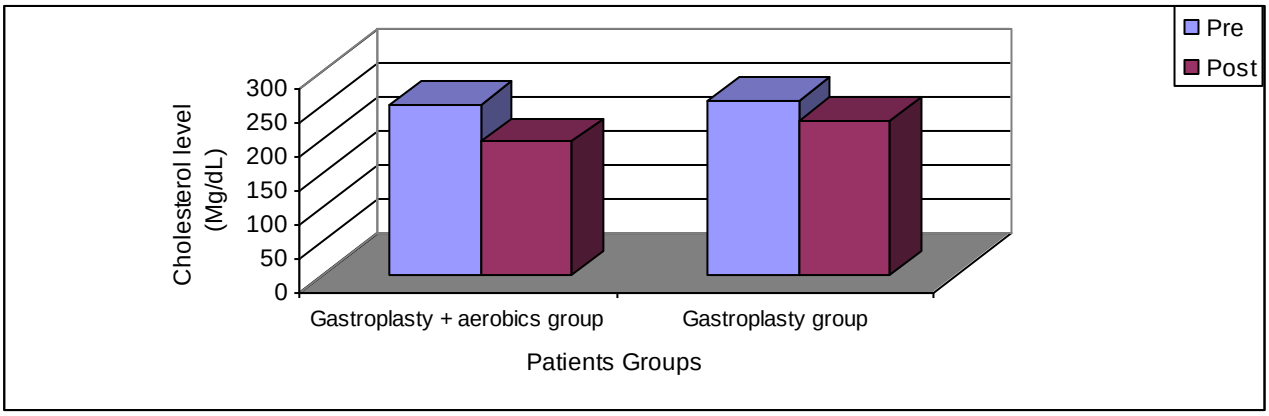

Fig. (3): Pre and post values of cholesterol of both groups.

DISCUSSION

The aim of this work was to determine the effect of aerobic training program on reduction of body weight following gastroplasty among adult obese females.

In the present study forty patients underwent vertical banded gastroplasty with aerobic exercises and showed significant reduction in BMI and serum cholesterol and triglycerides, these results were supported by many investigators.

The effectiveness of VBG to lose excess weight was noticed in a series of 60 gastroplasty operations based on Mason's vertical banded procedure. The operative treatment results in a reduction to within 40 percent of ideal weight in 80 percent of patients between 12 and 18 months after surgery[15].

On the other hand, it was noticed that the results from conservative therapeutic tools such as dietary intervention, exercise regimens, behavioural modification and even pharmacological adjuncts remain disappointing, with most patients either failing to lose weight or, for those able to lose weight, experiencing total weight regain within a few years. [16]Furthermore, such conservative measures do not sustain improvement in obesity-related co-morbidities. In contrast, bariatric surgery for the severely obese has resulted in an overall 61% weight reduction across all procedures and has been shown to eliminate or significantly ameliorate many of the obesity-related co-morbidities[17].

In long term assessment in an experimental study it was suggested that 70% of VBG were successful in terms of weight loss and also tendency after 2 years for weight regain. Maintaining excellent or good weight loss results[18].

It was postulated that the weight loss itself after VBG especially if it is accompanied by increased physical activity has a beneficial effect on reducing serum cholesterol and low density lipoprotein significantly while high density lipoprotein levels rise. Thus, risk factors for cardiovascular catastrophe are diminished and heart attacks and strokes are less likely to occur[19].

As it was mentioned before the forty patients underwent VBG. The higher rate of reduction in BMI and lipid profile in the study group was attributed to the effect of aerobic training program and these results were supported by many researchers.In 2002, Harrant, et al take biopsies of abdominal subcutaneous tissue before and immediately after two hours of exercises on ergometric

bicycle to investigate the effect of long lasting boat of exercise on the lipolytic β- and antilioplytic , α-2 adrenergic receptors and the antiliopolytic effect of insulin in obese subjects. They concluded that, after exercises, spontaneous lipolysis was significantly increased compared to the level before exercise. For the effect of insulin on lipolysis, there was no significant difference before and after exercises, the main finding of this study was the presence of significant exercise induced increase in β- adrenergic lipolytic effect in adipocytes obese subjects[20].

Fortunately, many authers had investigated the effect of eight months randomized trial involving different amounts and intensities of exercise among overweight men and women with dyslipidemia. They found that low amounts of exercise at moderate or high intensity were associated with potentially beneficial changes in plasma lipid profile. However, higher levels of high intensity exercise resulted in more pronounced changes in lipoprotein and were required to increase the high density lipoprotein cholesterol level, without significant weight loss[21].

Moreover it was reported that aerobic exercise on obese women led to loss of weight and decreased in body mass index because exercise training is a major modifiable component of total daily energy expenditure. It was Found that after 8 weeks of aerobic exercise, there was significant decrease in body mass index. This was explained as cycle ergometer leading to increase energy expenditure[22].

Many of the improvements in lipid profile variables and insulin sensitivity that are associated with habitual exercise are also seen after a single session of exercise. This finding could indicates that the short term effects of exercise on insulin signaling in muscle are a fundamental mechanism underlying many of the observed changes in the lipid profile. [23] Several studies have reported significant effects of aerobic exercise training on lipid profiles. In those studies, the exercise had induced larger weight losses and so, the effects was generally attributed in those previous studies to the greater weight loss even in the absence of any dietary interventions[23,7,4,5,8].

It was stated that during exercise the adrenal medullae release epinephrine and norepinephrine as a result of sympathetic stimulation these two hormones directly activate hormone sensitive triglyceride lipase that is present in the fat cells and this causes rapid break down of triglycerides and mobilization of fatty acids. Sometimes the free fatty acids concentration in the blood rises as much as 8 folds and the use of these fatty acids by the muscles for energy is increased[23].

Conclusion

According to the results of this work, it can be concluded that aerobic training program has an effective role on weight reduction after gastroplasty in obese females more than gastroplasty alone.

REFERENCES

1- Kenneth, G. and MacDonald, J.: Overview of the epidemiology of obesity and the early history of procedures to Remedy Morbid Obesity, Arch Surg; 138: 357-360, 2003.
2- Ogden, C., Glegal, K., Carroll, M. and Johson, C.: Prevalence and trends in overweight among US children and adolescents, 1999-2000, (PMID: 12365956) JAMA, (288): 1728-1732, 2002.
3- Sugermnan, H.J., Sugerman, E.L., Demaria, E.J., Kellum, J.M., Kennedy, C., Mowery, Y. and Wolfe, L.G.: Bariatric surgery for severely

obese adolescents. J GHastrointest Surg., Jan; 7(1): 105-107; Discussion 107-108, 2003.
4- Bray, G.A.: The underlying basis for obesity: relationship to Cancer, J Nutr, Nov; 132(11 supple); 3451-3455, 2002.
5- Goldberg, S., Rivers, P., Smith, K. and Homan, W.: Vertical banded gastroplasty: a treatment for morbid obesity. ARON J, Dec; 72(6):988, 991-993, 995-1003; quiz 1004-1010, 2001.
6- Hell, E., Miller, K.A., Moorehead, M.K. and Norman, S.: Elevation of health status and quality of life after bariatric surgery: Comparison of standard Roux-en-Y gastric bypass, vertical banded gastroplasty and laparoscopic adjustable silicone gastric banding. Obes Surg, Jun; 10(3): 214-219, 2000.
7- Grundy, S., Pasternak, R. and Greenland, P.: Assessement of cardiovascular risk by use of multiple-risk factor assessment equations: a statement of health-case professionals from the American Heart Association and the American College of cardiology. Circulation; (100): 1481-1492, 1999.
8- Thompson, P.D.: Additional steps for cardiovascular health, N Engl J Med; (347), 755-756, 2002.
9- World Health Organizaiton (WHO): Obesity: Preventing and managing the global epidemic: Report of a WHO Consultation World Health Org Tech Rep Ser., 894:i-xii, 1-253, 2000.
10- Whaley, M.: Predictors of over and under achievement of age predicted maximal heart rate, J. Med Scien In Sports and Exercise, 24: 173, 1996.
11- Karmali, S. and Shaffer, E.: The battle against the obesity epidemic: is bariatric surgery the perfect weapon?, Clin Invest Med. Aug; 28(4):147-156, 2004.
12- Kalfarentzos, F.M., Dimakopoulos, A. and Kehagias, L.: Vertical banded gastroplasty versus standard or distal R-en Y gastric bypass based on specific selection criteria in the morbidly obese: Premilinary results. Obes. Surg., 9: 433, 1999.
13- Eckhout, G.V., Willbanks, O.L. and Moore, J.T.: VBG for morbid obesity. Am. J. Surg. 152: 713-715, 1996.
14- Harrant, I., Marion, F., Crampes, F., De Glizeniski, I., Berlan, M., Stich, V. and Riviere, D.: International Journal of Obesity, October, 26(10): 1371-1378, 2002.
15- Kruaus, W.E., Torgan, G.E. and Duscha, B.D.: Studies of targeted risk reduction intervention through defined exercise Med Sci Sport Exerc; 33: 1774-1783, 2002.
16- Goldberg, S., Rivers, P., Smith, K. and Homan, W.: Vertical banded gastroplasty: a treatment for morbid obesity. ARON J, 72(6):988, 991-3, 995-1003; quiz 1004-1010, 2001.
17- Hinderliter, A., Sherwood, A. and Gullette, E.: Reduction of left ventricular hypertrophy after exercise and weight loss in overweight patients with mild hypertension, Arch. Intern. Med.; 162(12): 1333-1339, 2002.
18- Tall, A.R.: Exercise to reduce cardiovascular risk-How much is enough. N Engl J Med., 347: 1522-1524, 2002.
19- Wood, P.D., Stefanick, M.L. and Drean, E.M.: Changes in plasma lipids and lipoprotein in overweight women during weight loss through dieting, as compared with exercise, N Engl J Med., 319: 1173-1179, 1998.
20- Williams, P.T., Keauss, R.M. and Wood, P.D.: Effects of weight loss by exercise and by diet on apoliporotein A-I and A-II and the particle-size distribution of high density lipoprotein in meen. Metaboloism, 41: 441-449, 1992.
21- Leermakers, E.A., Dunn, A.l. and Blair, S.N.: Exercise management of obesity" med Clin North Am; 84(2): 419-440, 2000.
22- Stue-Ling Hand, D.J.: Surgical Management of Morbid obesity. Cushierie ER-Essential Surgery Practice. 1036-1044, 1995.
23- Snell, R.S.: Clinical anatomy for the medical students lippincott Williams and Wikins, A Wolters Kluwer Company, Philadelphia, 8th ed., 6, 2004.

الملخص العربى

تأثير برنامج التدريب الهوائي على إنقاص الوزن بعد عملية تدبيس المعدة في السيدات

تهدف هذه الهراسة إلى تقييم تأثير برنامج التدريب الهوائي على إنقاص الوزن بعد عملية تدبيس المعدة في السيدات . تم إجراء هذا البحث على أربعين مريضة بالسمنة المفرطة من اللاتي قد أجريت لهن عملية تدبيس المعدة وقد تراوحت أعماره ن من سن خمسة وعشرين إلى خمسة وأربعين وقد قسمت عينة البحث إلى مجموعتين متساويتين ، المجموعة الأولى "الاختبار" والمجموعة الثانية "الضابطة".
المجموعة الأولى : "الاختبار" تحتوي هذه المجموعة على عشرين مريضة حيث تم تطبيق برنامج التدريب الهوائي المختار لهن بعد ستة أسابيع من الجراحة ولمدة ستة أشهر والمكون من تمرينات هوائية على العجلة الثابتة لمدة أربعين دقيقة، ثلاث جلسات أسبوعياً . المجموعة الثانية : "الضابطة" تحتوي هذه المجموعة على عشرين مريضة أجريت لهن عملية تدبيس المعدة فقط. تم التقييم لكل مريضة في المجموعتين كالآتي : قياس الوزن والطول وحساب معدل كتلة الجسم وقياس نسبة الكوليسترول والدهون الثلاثية بالدم وذلك للمجموعتين . وقد أجريت هذه القياسات بعد ستة أسابيع من الجراحة وبعد ستة أشهر من الجراحة. أظهرت النتائج وجود فروق ذات دلالة إحصائية عالية ووجود تحسن واضح في مجموعة الاختبار بالمقارنة بالمجموعة الضابطة في معدل كتلة الجسم والكوليسترول والدهون الثلاثية بالدم فبدت أقل في مجموعة الاختبار عنها في المجموعة الضابطة. و لذلك فان برنامج التدريب الهوائي له تأثير على إنقاص الوزن بعد عملية تدبيس المعدة في السيدات اكثر من عملية تدبيس المعدة فقط .