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Survey of the Effective Exercise Habits of the Formerly Obese

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ABSTRACT

Background and Objective: Patients must subscribe to behavioral and lifestyle modifications for continued success after weight loss surgery (WLS). Few data exist about the ideal type, duration, and intensity of exercise for WLS patients. After surgery, should we mandate that patients exercise like a young, lean individual does? To reconcile this, we compared the exercise habits of successful bariatric surgery patients with physically fit controls.

Methods: One hundred individuals were enrolled. The operative group (OG) included 50 laparoscopic Roux-Y gastric bypass patients (LRYGB) who achieved excess weight loss of at least 80% one year after the surgery. The control group (CG) included 50 individuals of normal BMI who exercised regularly and did not undergo LRYGB. The exercise habits were compared using Fisher's exact and Mantel-Haenszel chi square tests.

Results: The 2 groups had equivalent BMIs (24.7 vs. 23.4 kg/m^2). The OG was older (39.5 years) than the CG (26.2 years). There was a statistically significant difference between the groups regarding cardiovascular exercise, 80% walking (OG) vs. 60% running (CG). OG patients exercised longer and with similar frequency as CG did. A high proportion of CG lifted weights (86%) vs. OG (44%). Sixty percent of CG performed recreational sports compared with 34% of OG.

Conclusion: Regular exercise is of utmost importance in maximizing and maintaining weight loss after WLS. Although patients who undergo WLS are older than the typical exercise enthusiast, they can achieve excellent weight loss and sustain a normal BMI with regular exercise habits that are quite distinct from younger individuals whose bodies were never undermined by obesity.

Key Words: Exercise, Gastric bypass, Obesity, Bariatric surgery.

INTRODUCTION

Patients must subscribe to behavioral and lifestyle modifications for continued success after weight loss surgery (WLS). Welch et al[1] stated that "Physical activity adherence was the sole significant behavioral predictor of weight loss," a logical declaration that is not well studied in the bariatric literature. The principles of diet, exercise, and behavioral alteration are well recognized; however, the details are underprovided.[2,3] Although exercise is generally acknowledged as an essential component of weight management, research has been generalized to overweight and (the spectrum of) obese individuals. None has been performed on patients with clinically severe obesity who have undergone bariatric surgery. In 1997, the World Health Organization (WHO) reported that "low intensity, prolonged physical activity such as purposeful walking for 30–60 minutes almost every day can substantially increase energy expenditure, thus reducing body weight and fat."

Although we mandate our patients to exercise regularly after surgery, we do not have enough data to describe the quality and quantity of exercise. After surgery, should we mandate that our patients exercise like a young, lean individual does? To reconcile this, we compared the exercise habits of successful bariatric surgery patients with those of physically fit controls.

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MATERIALS AND METHODS

One hundred individuals who met the criteria established by the Institutional Review Board (IRB) at Yale University School of Medicine were included in the study. Between August 2002 and July 2006, 405 LRYGB were performed by a single surgeon (RB) using a linear stapler technique. The Operative Group (OG) included 50 patients who achieved excess weight loss of at least 80% one year after the surgery. The Control Group (CG) comprised 50 individuals with ideal BMI (20 to 24.5 kg/m^2) chosen randomly from a local gym in New Haven, Connecticut. The subjects in CG volunteered to participate in the study after reading a flyer, explaining the nature of the study, was placed in the gym.

Both groups were given a 24-question survey about their exercise habits, such as frequency, duration, and form **(Figure 1)**. The survey analyzed the different aspects of exercise, such as cardiovascular, high intensity workouts,

1	How many days do you exercise per week?	1	2-3	4-7	Don't know	Other
2	How many hours do you exercise on a typical day?	<1	1-2	>2	Don't know	Other
3	For cardiovascular exercise do you…..?	Walk	Jog	Run	Don't know	Other
4	How many miles do you achieve per a typical cardiovascular exercise?	<1	1-3	3-5	Don't know	Other
5	How long does your cardiovascular exercise last?	<30min	>30min		Don't know	Other
6	Do you keep a record of your performance?	Yes	No			
7	Do you perform vigorous physical activity?	Yes	No		Don't know	Other
8	How many days a week would you perform vigorous activity?	1	2-3	4-7	Don't know	Other
9	How many hours does a vigorous exercise last/day?	<1	1-2	>2	Don't know	Other
10	Do you usually use the stairs or the elevator?	Stairs	Elevator			
11	How many flights of stairs do you climb up/day?	0	1-2	3-5	>5	Don't know Other
12	Do you perform weight-training exercises?	Yes	No			
13	If yes, how many days/week?	1	2-3	4-7	Don't know	Other
14	How many hours does the session last/day?	<1	1-2	> 2	Don't know	Other
15	Do you participate in recreational sports?	Yes	No			
16	If yes, how many days/week?	1	2-3	4-7	Don't know	Other
17	Do you do house work (eg, laundry, gardening, cleaning, etc…)?	Yes	No			
18	If yes, how many days/week?	1	2-3	4-7	Don't know	Other
19	Do you mow your own lawn?	Yes	No			
20	If yes, what do you use for lawn mowing?	Walking mower	Power mower			
21	At your place of employment, is strenuous work/activity involved?	Yes	No			
22	If yes, how long does it last/working day?	<30min	>30min		Don't know	Other
23	How much time do you stay inactive/day excluding normal hours of sleep (eg, watching TV, staying in bed, etc…)	<1	1-2	>2	Don't know	Other
24	How many hours do you sleep/day	4-6	6-8	8-10	>10	

Figure 1. Twenty-four question survey analyzing exercise and daily life habits.

and weight training. It also analyzed the different habits and lifestyle (active vs. sedentary) in OG and CG. OG patients were contacted during their office visits or via phone calls while CG individuals were given the survey directly in the gym.

The survey responses of the 2 groups were compared by using the *t* test, Fisher's exact and Mantel-Haenszel chi-square tests considering a P value of less than 0.05 to be statistically significant. The statistical analysis was performed by biostatisticians within the Yale Center for Clinical Investigation.

RESULTS

The demographics of the study groups are depicted in **Table 1**. The OG was older (mean age 39.5 years) than the CG (26.2 years). The initial weight and BMI in the OG were 267.9lbs and 44.1kg/m^2, which decreased to 151.3lbs and 24.7kg/m^2, respectively, one year after gastric bypass surgery. This compares favorably with CG subjects who had a mean weight of 160.1lbs and BMI of 23.4kg/m^2. Analysis of the data obtained from the survey **(Table 2)** showed that there was no significant difference between the 2 groups regarding exercise frequency. Most of the subjects worked out 4 to 7 days a week for 1 to 2 hours a day. However, the intensity of the cardiovascular exercise was significantly different between the 2 groups. Whereas 40 (80%) OG patients preferred to walk for cardiovascular exercise, the majority of the CG subjects (60%) ran for cardiovascular exercise (P<0.0001).

Despite these differences, further analysis of the data showed that most of the subjects in the 2 groups achieved the same number of miles during a typical exercise day ranging between 1 mile and 3 miles. Consequently, the duration of this workout was longer in the OG; 40 patients (80%) performed cardiovascular exercise for more than 30 minutes on a typical day compared with 33 individuals (60%) in the CG (P<0.05). More CG individuals performed vigorous physical activity (n=43, 86%) compared with OG (n=22, 44%) (P<0.0001); however, there was no statistically significant difference between the 2 groups with regard to the frequency of vigorous activity. The intensity was again demonstrated by comparing the weight training habits between the 2 groups. CG comprised 43 subjects (86%) who routinely lifted weights compared with 25 (50%) OG patients (P<0.05). For all study subjects who routinely lifted weights, the duration and frequency were statistically similar between the 2 groups.

Recreational sports were more prevalent in the CG group [30 subjects (60%)], while only 17 (34%) OG patients participated in recreational sports (P<0.05). On the other hand, OG subjects showed more tendencies to use the stairs rather than the elevators (P<0.05), typically climbing more than 5 flights a day. Furthermore, 32 (64%) OG patients performed housework 4 days to 7 days a week, eg, laundry, gardening, cleaning, compared with 5 (10%) CG patients (P value of no statistical significance). Finally, concerning inactivity periods during the day and sleep duration, the 2 groups demonstrated similar patterns.

DISCUSSION

The role of postoperative behavioral and diet modifications after WLS is well documented in the bariatric literature. Emphasizing the role of exercise to the bariatric population pre- and postoperatively is a standard practice by the bariatric surgeons and is part of the multidisciplinary approach to the treatment of obesity. However,

Table 1.
Demographics of Study Groups

Characteristics	Weight Loss Surgery (N=50)	Control Group (N=50)	P Value
Age	39.46 ± 8.95	26.22 ± 4.53	<0.0001
Male	3 (6)	31 (62)	<0.0001
Female	47 (94)	19 (38)	
Height	65.20 ± 2.98	69.56 ± 4.36	<0.0001
Weight	267.96 ± 38.50	N/A	N/A
Weight at 12 months	151.32 ± 15.80	160.14 ± 28.65	NS
BMI	44.13 ± 5.14	N/A	N/A
BMI at 12 months	24.74 ± 1.77	23.42 ± 2.82	<0.05

Table 2.
Analysis of Exercise and Lifestyle Habits

	Operative Group (n=50) (%)	Control Group (n=50) (%)
Q1 How many days do you exercise per week?		
0	2 (4)	0 (0)
1	1 (2)	1 (2)
2–3	23 (46)	17 (34)
4–7	24 (48)	32 (64)
Q2 How many hours do you exercise on a typical day?		
< 1	21(42)	14 (28)
1–2	25 (50)	35 (70)
> 2	4 (8)	1 (2)
Q3 For cardiovascular exercise do you . . .?		
Walk*	40 (80)	2 (4)
Jog	4 (8)	14 (28)
Run	4 (8)	30 (60)
Other	2 (4)	4 (8)
Q4 How many miles do you achieve per a typical cardiovascular exercise?		
< 1	6 (12)	2 (4)
1–3	22 (44)	21 (42)
3–5	14 (28)	19 (38)
Other	2 (4)	6 (12)
Don't know	6 (12)	2 (4)
Q5 How long does your cardiovascular exercise last?		
< 30 min†	6 (12)	16 (32)
> 30 min	40 (80)	33 (66)
Other	0 (0)	1 (2)
Don't know	4 (8)	0 (0)
Q6 Do you keep a record of your performance?		
Yes	8 (16)	11 (22)
No	42 (84)	39 (78)
Q7 Do you perform vigorous physical activity?		
Yes	22 (44)	43 (86)
No	28 (56)	5 (10)
Other	0 (0)	1 (2)
Don't know	0 (0)	1 (2)
Q8 How many days a week would you perform vigorous activity?		
1	0 (0)	3 (6)
2–3	8 (16)	22 (44)
4–7	14 (28)	18 (36)
N/A	28 (56)	4 (8)
Don't know	0 (0)	3 (6)

Table 2 continued on next page.

Table 2.
Analysis of Exercise and Lifestyle Habits

	Operative Group (n=50) (%)	Control Group (n=50) (%)
Q9 How many hours does a vigorous exercise last/day?		
< 1	6 (12)	21 (42)
1–2	12 (24)	21 (42)
> 2	4 (8)	1 (2)
N/A	28 (56)	4 (8)
Other	0 (0)	1 (2)
Don't know	0 (0)	2 (4)
< 1	6 (12)	21 (42)
Q10 Do you usually use the stairs or the elevator?		
Stairs†	39 (78)	29 (58)
Elevator	11 (22)	21 (42)
Q11 How many flights of stairs do you climb up/day?		
0†	11 (22)	1 (2)
1–2	15 (30)	8 (16)
3–5	7 (14)	24 (48)
> 5	17 (34)	14 (28)
N/A	0 (0)	1 (2)
Don't know	0 (0)	2 (4)
Q12 Do you perform weight training exercises?		
Yes†	25 (50)	43 (86)
No	25 (50)	7 (14)
Q13 If yes, how many days/week?		
1	4 (8)	7 (14)
2–3	11 (22)	24 (48)
4–7	10 (20)	12 (24)
N/A	25 (50)	7 (14)
Q14 How many hours does the session last/day?		
< 1	13 (26)	22 (44)
1–2	10 (20)	21 (42)
> 2	2 (4)	0 (0)
N/A	25 (50)	7 (14)
Q15 Do you participate in recreational sports?		
Yes†	17 (34)	30 (60)
No	33 (66)	20 (40)
Q16 If yes, how many days/week?		
1†	5 (10)	16 (32)
2–3	10 (20)	10 (20)
4–7	2 (4)	0 (0)
N/A	33 (66)	20 (40)
Don't know	0 (0)	1 (2)
Other	0 (0)	3 (6)

Table 2 continued on next page.

Table 2.
Analysis of Exercise and Lifestyle Habits

	Operative Group (n=50) (%)	Control Group (n=50) (%)
Q17 Do you do house work (e.g. laundry, gardening, cleaning, etc . . .)?		
Yes	48 (96)	47 (94)
No	2 (4)	3 (6)
Q18 If yes, how many days/week?		
1*	3 (6)	22 (44)
2–3	13 (26)	20 (40)
4–7	32 (64)	5 (10)
N/A	2 (4)	3 (6)
Q19 Do you mow your own lawn?		
Yes†	11 (22)	3 (6)
No	39 (78)	47 (94)
Q20 If yes, what do you use for lawn mowing?		
Walking mower	4 (8)	2 (4)
Power mower	7 (14)	1 (2)
N/A	39 (78)	47 (94)
Q21 At your place of employment, is strenuous work/activity involved?		
Yes	7 (14)	4 (8)
No	43 (86)	46 (92)
Q22 If yes, how long does it last/working day?		
< 30 min	0 (0)	2 (4)
> 30 min	7 (14)	2 (4)
N/A	43 (86)	46 (92)
Q23 How much time do you stay inactive/day excluding normal hours of sleep (e.g. watching TV, staying in bed, etc . . .)		
< 1	7 (14)	12 (24)
1–2	24 (48)	21 (42)
> 2	19 (38)	15 (30)
Don't know	0 (0)	2 (4)
Q24 How many hours do you sleep/day?		
4–6	9 (18)	5 (10)
6–8	31 (62)	44 (88)
8–10	8 (16)	1 (2)
>10	2 (4)	0 (0)

*P<0.0001.

†P<0.05.

Groups were compared using t-tests for continuous variables and chi-square test or Fisher's exact test or Mantel- Haenszel chi-square test for categorical ones.

few data exist about the ideal type, duration, and intensity of exercise for WLS patients. After surgery, should we mandate that patients exercise like a young, lean individual does? Should they engage in a vigorous high-intensity exercise program? Does low pace, low intensity, but consistent exercise positively affect weight loss? To our knowledge, our study is the first to analyze the type, intensity, and frequency of exercise needed after WLS.

Typical results for patients undergoing gastric bypass include weight loss of 60% to 80% of excess weight as well as significant improvement in comorbid conditions.[4] However, these results represent population averages and naturally will vary from individual to individual. Exercise, diet, psychological and social factors have all been found to play a significant role in long-term weight loss.[5–7]Additionally, attendance at support groups has been found to optimize the postoperative weigh loss.[8,9]

Although exercise is generally acknowledged as an essential component of weight management, research has been generalized to overweight and (the spectrum of) obese individuals. None has been performed on patients with clinically severe obesity who have undergone bariatric surgery. In a recent study,[1] individuals who have undergone surgical weight loss have a lower level of endurance for physical activity, despite a normal weight, compared with normal weight individuals who have not undergone surgical interventions. The American College of Sports Medicine recommendations on healthy exercise levels are a minimum of 150 minutes (2.5 hours) of moderate intensity exercise per week, stating that there may be advantages to increasing the exercise level to as much as 3.5 hours a week for maintaining long-term weight loss. Other reviews have cited a daily exercise component with as much as 90 minutes a day being important, although even 30 minutes a day of moderate exercise is noted to be facilitative.[10]

In this study, the exercise habits of both OG and CG were compared, specifically to elicit information about the duration, frequency, intensity, type of exercise, and baseline activity level. Notarius et al[11] suggested that although successful surgical weight-loss patients have an increased exercise duration capacity, the restricted diet associated with surgical weight loss and low energy intake may be causal for a lower level of max VO2 and endurance. Max VO2 is defined as "the highest rate of oxygen consumption attainable during maximal or exhaustive exercise."[12] Our study likewise suggests a lowered level of endurance with respect to both the quality and the length of exercise. Additionally, the OG preferred lower intensity activities, albeit with a greater frequency compared with the CG.

As our study indicates, the activity type, duration, and intensity are quite distinct from the exercise habits of young, physically fit, controls. Successful weight loss surgery patients typically exercise longer, but at lower-level intensity; these findings are in line with the recommendations from the American College of Sports Medicine for weight loss strategies and preventing weight regain.[10]

Our results duplicate the findings of Silver et al[13] in a cross-sectional survey analysis that included 140 responders. In Silver's study, 116 (82.9%) with successful weight loss 2 years after the surgery were engaged in a moderate level of physical activity postoperatively.

The International Association for the Study of Obesity (IASO) recommends 45 minutes to 60 minutes of moderate intensity activity each day. The IASO 1st Stock Conference was held in Bangkok in May 2002, where experts discussed the different characteristics of physical activity in relation to obesity. The consensus statement was:

The current physical activity guideline for adults of 30 minutes of moderate intensity activity daily, preferably all days of the week, is of importance for limiting health risks for a number of chronic diseases including coronary heart disease and diabetes. However for preventing weight gain or regain this guideline is likely to be insufficient for many individuals in the current environment. There is compelling evidence that prevention of weight regain in formerly obese individuals requires 60 minutes to 90 minutes of moderate intensity activity or lesser amounts of vigorous intensity activity. Although definitive data are lacking, it seems likely that moderate intensity activity of approximately 45 minutes to 60 minutes per day, or 1.7 PAL (Physical Activity Level) is required to prevent the transition to overweight or obesity. For children, even more activity time is recommended. A good approach for many individuals to obtain the recommended level of physical activity is to reduce sedentary behavior by incorporating more incidental and leisure-time activity into the daily routine. Political action is imperative to effect physical and social environmental changes to enable and encourage physical activity. Settings in which these environmental changes can be implemented include the urban and transportation infrastructure, schools, and workplaces.[14]

In our study, we did not aim to examine the role of exercise in weight loss after bariatric surgery, because this is well established in the medical literature; accordingly,

we did not need to compare the postoperative bariatric group with a control group of surgical patients who did not exercise. We focused on analyzing the different perspectives of low-to-moderate intensity exercise that should be achieved postoperatively by WLS patients. A healthy, active lifestyle should also include using the stairs, mowing the lawn, housework, gardening, and other such things. The long-term goals are related: to optimize weight loss after surgery and to prevent weight regain. Both goals can be accomplished by regular, low-to-moderate intensity exercise, and a generally active lifestyle. One of the limitations in the study was the specificity of the questions, rather than having the respondent write in the activities performed and the duration of the activity. This might have led to underreporting of some physical activities if they were not listed on our questionnaire.

In 1996, the US Surgeon General reported that 60% of Americans were sedentary and that it was "commonly believed" that physically active people were less likely to gain weight over the course of their lives and that low levels of physical activity were a cause of obesity.[15] In 1997, the WHO reported that, "low intensity, prolonged physical activity such as purposeful walking for 30–60 minutes almost every day can substantially increase energy expenditure, thus reducing body weight and fat."[16] This was reemphasized by the US NIH National Heart, Lung and Blood Institute in 1998.[17] The institute concluded that all adults should set a long-term goal to accumulate at least 30 minutes, or more, of moderate-intensity physical activity on most, and preferably on all, days of the week. Three years later (December 2001), the first national action plan for preventing and decreasing overweight and obesity in the US was published by the Surgeon General.[18] The report emphasized the need to strictly follow the Federal physical activity recommendations of 30 minutes of brisk walking on 5 or more days a week.

Our study sets rational guidelines for postoperative exercise habits; however, a long-term follow-up is needed to examine the pattern of exercise tolerance and performance of postoperative patients, whether it increases, declines, or plateaus with time. Even though the study was not adjusted for age with OG being older than CG, we believe this was a strong point rather than a limitation as this accentuated the hypothesis that we do not have to demand the older postoperative patients to exercise as younger nonsurgical individuals do.

CONCLUSION

Regular exercise is of utmost importance in maximizing and maintaining weight loss after WLS. Although patients who undergo WLS are older than the typical exercise enthusiast, they can achieve excellent weight loss and sustain a normal BMI with regular exercise habits that are quite distinct from those of younger individuals whose bodies were never undermined by obesity.

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