

ORIGINAL ARTICLE

IJPHY

VACUUM THERAPY VERSUS ABDOMINAL EXERCISES ON ABDOMINAL OBESITY

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ABSTRACT

Background: Obesity is a medical condition that may adversely affect wellbeing and leading to increased incidence of many health problems. Abdominal obesity tends to be associated with weight gain and obesity and it is significantly connected with different disorders like coronary heart disease and type II diabetes mellitus. This study was conducted to investigate the efficacy of vacuum therapy as compared to abdominal exercises on abdominal obesity in overweight and obese women.

Methods: Thirty overweight and obese women participated in this study with body mass index $> 25 \text{ kg/m}^2$ and waist circumference $\geq 85 \text{ cm}$. Their ages ranged from 28 - 40 years old. The subjects were excluded if they have diabetes, abdominal infection diseases or any physical limitation restricting exercise ability. They were randomly allocated into two equal groups; group I and group II. Group I received vacuum therapy sessions (by the use of LPG device) in addition to aerobic exercise training. Group II received abdominal exercises in addition to the same aerobic exercises given to group I. This study was extended for successive 8 weeks (3 sessions/ week). All subjects were assessed for thickness of the abdominal skin fold, waist circumference and body mass index.

Results: The results of this study showed a significant difference between group I and group II post-intervention as regarding to the mean values of waist circumference and abdominal skin fold thickness ($p < 0.05$).

Conclusion: It can be concluded that aerobic exercises combined with vacuum therapy (for three sessions/week for successive 8 weeks) have a positive effect on women with abdominal obesity in terms of reducing waist circumference and abdominal skin fold thickness.

Keywords: Vacuum therapy, Abdominal Exercises, Aerobic Exercises, Abdominal Obesity, Women, Obesity.

Received 16th April 2016, revised 07th May 2016, accepted 19th May 2016



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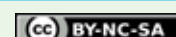
10.15621/ijphy/2016/v3i3/100827

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INTRODUCTION

Obesity is a medical condition in which extra body fat has deposited to the degree that it might adversely affect body health, leading to diminished life expectancy and/or increased health issues [1]. In the previous two decades, overweight and obesity have altogether expanded in most industrialized countries [2]. The general concern about expanding levels of obesity in many populations is becoming more obvious with the accumulating evidence that increased abdominal fat contributes to the development of cardiovascular diseases independently of the influence of total body fat [3].

Abdominal obesity, also known as belly fat or clinically as central obesity, is when extra abdominal fat has accumulated to the degree that it increases the waist size and resulting in a negative impact on health [4]. Abdominal fat tends to increment with weight gain and is significantly connected with different disorders like coronary heart disease and type II diabetes mellitus [5]. Moreover, abdominal obesity is connected with expanded levels of visceral fat. This shows up mostly in charge of some metabolic problems such as glucose intolerance, insulin resistance, increased levels of total and low-density lipoprotein cholesterol and decreased levels of high-density lipoprotein cholesterol [6,7]. Nevertheless, a lessening in abdominal fat has a tendency to decrease these complications thereby diminishing the danger for cardiac problems [8].

Exercise is one of the most common essential elements of weight reduction programs. Aerobic exercises can be defined as any physical activity that uses large muscle groups and causes the body to use more oxygen than it would while resting [9]. Aerobic exercises have been appeared to improve the probability of maintaining body weight [10]. Moreover, there is confirmation that exercise may have the advantage of keeping the waistline trim by significantly decreasing abdominal fat [11]. Other investigators have demonstrated a reduction of total abdominal, abdominal subcutaneous and visceral fat following aerobic exercises [12].

Abdominal exercises are helpful for strengthening the abdominal muscles. They are known to increase the strength and endurance of the abdominal muscles [13]. They are frequently recommended as successful means to lessen abdominal fat and reduce the waistline. It has been highly disputed whether or not abdominal exercises have any reducing effects on abdominal fat. Fat cell size of adipose tissue was investigated to determine the efficacy of abdominal exercises on subcutaneous fat tissue [14]. The researchers demonstrated that progressive abdominal exercises can produce a perceptible decrease in the size of the fat cell within the abdominal area. On the other hand, it was reported that abdominal exercise training alone is not adequate to decrease abdominal fat and circumference and it is important to incorporate aerobic exercises to gain more beneficial effects on abdominal obesity [13].

Vacuum therapy is a therapeutic modality which is used

to assist in localized weight loss by creating skin folds to stretch the underlying tissues and subsequently the fat cells become smaller in size. Most of the programs which are directed to control abdominal obesity are experimental and lack the validation through scientific research which is requested with other medicinal practices [15]. Since vacuum therapy and exercise are the most frequently cited methods for women attempting to decrease abdominal obesity, the aim of this study was to evaluate the efficacy of vacuum therapy as compared to abdominal exercise training on abdominal obesity in overweight and obese women.

METHODOLOGY

Subjects

Thirty adult women shared in this study. They were recruited from Al-Golf Specialized Hospital, Cairo, Egypt. Their age ranged from 28 to 40 years old. They were overweight or obese with body mass index (BMI) $< 25 \text{ kg/m}^2$ and waist circumference $\geq 85 \text{ cm}$ according to the criteria for abdominal obesity as defined by the Korean society for the study of obesity [16]. The subjects didn't undergo any diet regimen in the previous six months. The exclusion criteria were as follows: diabetes, cancers, pregnancy, inflammatory or infection diseases in the abdomen, physical limitation restricting exercise ability, history of regular exercise program for weight loss in the last six months and current use of other methods that might cause general or local weight reduction such as drugs, herbs, acupuncture or cream products.

Experimental methods were fully explained for each participant. The subjects were randomly allocated into two equal groups by the use of a computer-generated randomized table of numbers. The two groups were: the vacuum therapy group (G1) and the exercise group (G2). Subjects in (G1) received vacuum therapy sessions in addition to aerobic exercise program. Subjects in (G2) received abdominal exercises in addition to the same aerobic exercise program. An informed consent was obtained from all participants.

PROCEDURE

The following measurements were taken for all participants in the first session and eight weeks later: Body weight, height, waist circumference and abdominal skin fold thickness. The height of each participant was measured from standing position bare feet after instructing her to look straight forward and to inspire deeply and hold the breath.

Body weight was measured by a digital scale. Waist circumference was measured by a tape measurement at half the distance between the bottom edge of the last rib and the iliac crest [17]. The measurements were taken at the end of a gentle expiration while subjects were standing and without pulling the tape tightly.

For measurement of the skin fold thickness, Lange Skin Fold Caliper was used.

From a comfortable upright standing position, a fold of skin was lifted far from the body by grasping it firmly between

the index and thumb fingers of the assessor's left hand. The skin fold was rolled to confirm that subcutaneous layer was being assessed (not muscular layer). This is followed by positioning the jaws of the caliper over the skin fold by one centimeter beneath assessor's fingers. The assessor waited to two seconds after releasing the hold, and then she took the measurement of the caliper. The assessment was done at the abdominal region in a raised vertical fold; two centimeter away from the right lateral side of the umbilicus. The measurement was performed for three times and reported as the average of the three measurements [18].

All participants in (GI) received vacuum therapy (three sessions/week for successive 8 weeks) in addition to aerobic exercise program. Vacuum therapy was applied over three stages: electro stimulation stage (stage I), cell sonic stage (stage II) and suction & mechanical effect stage (stage III).

Stage I: which aims to improve strength and vascularization of the abdominal muscles by the use of electro stimulation technique? This technique induces two effects; lipostimulation and myostimulation through the use of four pairs of electrodes (eight electrodes) which are placed as follows [15]:

- The first pair of electrodes was placed above the umbilicus and the second pair was placed below it. Each pair was placed parallel to the midline with six cm distance between the electrodes. The other two pairs of electrodes were placed as one pair on each side of the abdomen (right and left) parallel to the first and second pairs above the anterior superior iliac spine (ASIS).

Stage II (cell sonic stage) which uses low frequency ultra-sounds to provide a noninvasive painless method for spot reduction and to debulk stubborn fat deposit. The low frequency ultrasound oscillates between 28 and 32 KHz and was applied under stationary conditions with the use of four independent generators with conductive gel. Two generators were placed on each side parallel to the umbilicus.

Stage III (vacuum stage): which combines two effects; suction and mechanical effects [16]. This stage was applied by the use of vacuum transparent massage head to apply perfect glide over the abdomen. It involved spraying of essential oils through the vacuum massage head aiming to soothing, anti-inflammatory and draining. Once absorbed by the skin, essential oils ease circulation and enable the perfect slide on the skin. No gel was needed.

All participants in both groups received aerobic exercise program which was given for three times /week for successive eight weeks. Each session lasted for 60 min. It began with a 10min warming-up exercises in the form of stretching exercises and slow-paced walking on treadmill. Then, participants were instructed to walk or jog on the treadmill (for 40 min) at a speed that made exercise heart rates between 60% and 75% of the person's age-adjusted expected maximum heart rate, as commended by the American College of Sports Medicine (ACSM)[19]. The upper and

lower limits for each person's aerobic heart rate range was calculated by the use of this formula: $(220 - \text{age}) \times (0.60 [\text{lower-limit}] \text{ or } 0.75 [\text{upper-limit}])$. Treadmill speed was modulated as necessary to guarantee that subjects stayed within the upper- and lower-limits of aerobic exercise for the period of each exercise session. In the last 10 min of each session, the participants were instructed to perform cool down exercises which consisted of stretching and relaxing exercises.

Participants in GII received abdominal exercises in addition to aerobic exercises. The subjects were asked to perform six abdominal exercises, for 2 sets of 10 repetitions, on three times per week for successive eight weeks. The subjects were asked to implement the designed exercise program with 30 sec of rest between each set. The duration of each exercise session was about 20 min. Each exercise was practiced in a slow and controlled way to guard against any muscle harm when exercising. These exercises are:[13]

1- From crocklying position with upper limbs across the chest: each participant was asked to raise the shoulders as much as she can and then return back to the starting position for one repetition.

2- From standing position with feet shoulder-width separated while carrying a 2-kg dumbbell in one hand: each participant was asked to laterally flex the trunk toward one side to the extent she can so that the dumbbell glide over the lateral aspect of the corresponding thigh (for ten times). The same task was repeated for another ten times toward the opposite side. This was considered as one set. The load was expanded by 0.9 kg every alternate day till reaching to 6.36 kg.

3- From crock lying position and hands behind the neck: Each participant was instructed to put the right ankle over the flexed left knee followed by moving the left elbow toward the right knee and then return back to starting position. Once reaching ten repetitions, the same exercise was repeated on the opposite side for one set.

4- While the lower back rested on a gymnastic ball (trunk parallel to the floor) and upper limbs crossing the chest: Each subject was instructed to flex the trunk to about 45° and then return back to the initial position for one time.

5- From lying flat on the floor and arm beside the body: each participant was instructed to flex the hips and knees, rest the legs over the ball, and slowly twist at the waist to the left till the left knee touch the floor and then to return back to the initial position (for ten times). The same exercise was repeated for another ten times toward the right side. This was considered as one set.

6- From crock lying position with the fingers pointing to the knees: each participant was instructed to raise the shoulders till the fingers touch the knees and to return back to the starting position for one repetition.

Statistical analysis

The variables were presented using descriptive statistics; arithmetic mean (and standard deviation (SD)). Paired

sample t-test was used to identify the difference within the same group and unpaired sample t- test was used to test the significant difference between the two groups. All statistical calculations were made using the SPSS software package (version 23.00).

RESULTS

Unpaired sample t-test proved homogeneity between both groups as there were no statistical significant differences between GI and GII as regarding to age, body weight, height, BMI, waist circumference and abdominal skin fold measurement. These results proved that the baseline values would not interfere with the analysis. The demographic characteristics of the two groups are listed in table 1.

Comparison between pre and post treatment mean values of all variables being tested in both groups showed statistically significant differences. Additionally, there was a significant difference between the two groups post-treatment in the mean values of waist circumference and abdominal skin fold measurement. Conversely, the results proved a non-significant difference between the two groups post-intervention in the mean values of BMI. The changes in the mean values of all variables tested are presented in table 2.

Table 1: Demographic characteristics of patients in experimental and control groups.

	Vacuum therapy group (n=15)	Exercise group (n=15)	t-value	P-value
Age (year)	33.2±5.05	32.4±4.4	0.46	0.64
Height (m)	1.54± 0.06	1.58± 0.05	-1.5	0.13
Body weight (Kg)	91.2±6.6	91.2±9.2	0.04	0.96
BMI	38.2±2.7	36.5±3.6	1.41	0.17

Values are mean ± SD.

BMI: Body mass index

*Significant at p<0.05.

Table 2: Changes in outcome measures in the experimental and control groups at baseline and following treatment.

	Baseline	Post-treatment	t-value	P value
BMI (kg/m2)				
Vacuum therapy group (N=15)	38.2±2.7	32.3±2.2	20.9	0.001*
Exercise group (N=15)	36.5±3.6	34.4±3.7	11.7	0.001*
P value	0.17	0.09		
Waist circumference (cm)				
Vacuum therapy group (N=15)	96.4±4.2	86.1±5.2	10.39	0.001*
Exercise group (N=15)	97.8±6.8	92.9±8.3	5.34	0.001*
P value	0.49	0.01*		
Skin fold measurement (mm)				
Vacuum therapy group (N=15)	45.3±7.5	38.3±7.1	10.21	0.001*
Exercise group (N=15)	46.4±8.1	44.1±8.1	6.39	0.001*
P value	0.67	0.04*		

Values are mean ± SD.

BMI: Body mass index.

*Significant at p<0.05.

DISCUSSION

Formerly, obesity was recognized as an individual issue and it was managed by simply eating less and practicing more physical exercises. Mild degrees of obesity have been avoided by consistent exercises and self-control [20,21]. Nevertheless, many problems including hypertension, diabetes, hyperlipidemia and some social issues might result from progression of obesity into more morbid levels. Obesity might expand the mortality rate due to associated cardiac problems and cerebrovascular accidents^[22]. The techniques for treating obesity can be partitioned into an intrusive strategy, specifically surgery, and noninvasive strategies, for example, exercises, dietary control, behavioral rectification and treatment by medications [23]. With more progression in science and technologies and after clarification of the physiology of obesity to some degree, endeavors to successfully improve and avert obesity are being made utilizing noninvasive strategies [24].

This study was intended to evaluate the effectiveness of vacuum therapy as compared to abdominal exercises on abdominal obesity in overweight and obese women. The results of this study showed significant difference between the two groups post-intervention as regarding to waist circumference and skin fold thickness (in favor to the vacuum therapy group). These results might be attributed to the combined effect of both aerobic exercises and vacuum therapy on abdominal region in GI. Vacuum therapy has a local effect as it is used to assist in localized weight loss by creating skin folds, stretching the underlying tissues and therefore, the fat cells become smaller and skin smoother[15]. This is in consistent with Kutlubay et al [25] who concluded that LPG is a well-endured and successful option treatment methodology for thinning and body shaping. Moreover, Maurer [26] showed that rolling suction is effective in reducing edema in fat cell and circulatory improvement. Additionally, it was proved that vacuum therapy is effective in stimulation of lymphatic flow and subcutaneous collagen production, vertical stretching of connective tissue and increased metabolism of fat cell [27,28].

In previous studies performed by Ersek et al [29,30] LPG was proved to be effective in certain body areas like thighs, hips and waist.

Currently, the best and most common strategy to control obesity is exercise because it is exceptionally successful in changing body configuration. It was proved that aerobic exercise can enhance or maintain physical fitness and general health. It can reinforce both muscular and cardiovascular systems, improve athletic skill and enhance weight loss [31]. Moreover, Millers et al [32] concluded that a 15-week exercise program plus diet results in a weight reduction of about eleven kilograms, with about eight kilograms maintained loss after one year. Lee[33] declared that the application of moderate intensity exercises of no less than 5 times per week is beneficial. Additionally, it was concluded that a 3 month aqua aerobics training program greatly con-

tributed to positive changes in lipid metabolism in women with abdominal obesity[17]. It was proved that aerobic exercises for twelve weeks are effective in reducing BMI and the percentage of body fat[34]. Consequently, exercises can be prescribed as a program to control obesity.

In contrast to previous research, however, the intervention in the present study showed significant difference in abdominal fat only (in the form of decrease in both waist circumference and abdominal skin fold thickness) and insignificant difference in BMI between the two groups after intervention. It is considered that this was because the intervention was relatively less in frequency and short in duration than those of previous studies. If the intervention was more frequent and longer in duration, this research would most likely acquire similar results as those in preceding studies.

Noteworthy of mention here is that abdominal exercises are regularly advanced as a compelling intends to diminish abdominal fat and trim the waistline. It was proved that abdominal exercises can affect the size of fat cells [13].

Additionally, Katch et al [14] investigated the efficacy of abdominal training on subcutaneous fat. After randomly assigning 19 young Caucasian men into two groups (exercise & control groups) for four weeks, the investigators showed that a progressive sit-up exercise program is effective in reducing the size of the fat cells in the abdominal, subscapular, and gluteal region. Additionally, Kordi et al [35] proved that twelve weeks of local abdominal resistive exercise (three times per week) plus diet were effective in decreasing body weight, BMI, waist circumference and skin fold thickness.

CONCLUSION

For overweight and obese women, a combination of vacuum therapy and aerobic exercises for successive eight weeks has a positive effect on abdominal obesity in terms of reducing waist circumference and abdominal skin fold thickness.

Acknowledgements

All authors thank all subjects who shared in this study with all content and cooperation.

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Citation

Mohammed Gharib, N., & Hussein Diab, R. (2016). VACUUM THERAPY VERSUS ABDOMINAL EXERCISES ON ABDOMINAL OBESITY. *International Journal of Physiotherapy*, 3(3), 280-285.