

The Effect of Different Methods Used in Regional Slimming and Cellulite Treatment on Regional Weight Loss

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Abstract

Background: The prevalence of obesity increases in both developed and developing countries. Beside individuals have started to seek ways of changing their aesthetic appearance by easy methods. **Objectives:** This study was conducted in an attempt to identify the effect of methods performed through a device for regional weight loss on the regional fat mass and body composition to reduce regional fat and cellulites. **Materials and Methods:** A total of 68 women willing to reduce fat on their gluteal-femoral regions participated in the study. Three different methods were adopted for the participants divided into three groups for regional weight loss in line with the medical advice of the center they consulted. The methods used are Ultrasound & Radiofrequency (Exilis-2011, BTL Medical Devices), cavitation method (Ultrasound Cavitation Eximia -2010, 1065 DJ Cosmo Plus), and Shock Wave Treatment (AWT Acoustic Wave Therapy D- Actor, 2007-2008 Medlaser Storz). Arithmetic average and standard deviation were used for statistical assessment of data, and an analysis of variance test on repeated measures was conducted. **Results:** The type of the method led to a significant difference ($p < 0.05$) between the first and the final measurements in terms of body weight, waist and hip circumference, BMI, total fat mass, right leg/left leg and trunk fat mass. **Conclusion:** It was found out that the methods adopted proved to be factors contributing to a significant decrease in total body fat, regional fat mass and cellulite of all participants.

Keywords: Cellulite; Regional fat; Regional slimming; Weight loss

Introduction

In today's world where healthy life and looking good go hand in hand, the effort to include both factors in cosmetic practices has brought about some innovations. The qualities of requiring no anesthesia, causing relatively less pain with brief methods in non-hospital centers with no restriction on daily life have boosted the interest in beauty centers [1]. Regional weight loss and cellulite treatments are primary methods among others available in beauty centers.

Cellulite creates a subcutaneous image of "orange peel", and appears as a widespread problem among women. It is possible to minimize this image through some treatment methods even though cellulite does not pose any health risk [2]. Although cellulite is not a pathological case, it is considered as a cosmetic problem by most of the adult women, and it affects over 85-98% of women after childbirth [3]. Non-surgical solutions and many other methods have been introduced to remove regional fat and cellulites.

The goal herein is to minimize the fatty tissue and provide a smooth appearance [4]. The ultrasound and radiofrequency method is a non-invasive method ensuring regional slimming and minimization of cellulites as well as tightening the skin [5,6]. Dermis and epidermis aim at enabling heat to reach the depths of the skin and the fatty tissue without any need for surgical operation. The mechanical energy of the ultrasound and the energy of the radiofrequency collectively help to decrease the volume of fat cells and tighten the skin texture. It has no reported side effect on internal organs. It also contributes to an increase in collagen production and renewal [6].

The ultrasound, another method for regional weight loss, aims at burning subcutaneous fat through sound waves. It not only decreases the fatty tissue but also tightens the skin [7,8].

The acoustic wave treatment (AWT) is a method used for regional lipoidosis and cellulite treatment. It is proved that AWT stimulates fat cells through acoustic waves penetrating into subcutaneous tissue, and also stimulates the transformation within the fatty tissue and dissolves it, and helps to renew the collagen tissue in dermis. There are findings indicating that the AWT is an effective and a reliable method [9-13].

It is safe to say that such methods intended for regional weight loss can be adopted for adults with no chronic disease (kidney disease, liver disease, diabetes etc.) and pregnancy but having regional lipoidosis and cellulites problems.

This study was conducted to identify the effect of some methods, used to ensure regional slimming and to minimize cellulites, on the regional and body composition.

Materials and Methods

Participants

This study was conducted in a private clinic in Ankara owned by

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a dermatologist, and equipped with devices for regional weight loss. A total of 68 women willing to minimize their regional fat and cellulites (gluteal-femoral regions) constituted the working group. Participants were those who overweight according to the BMI and did not have any health problems applying to the clinic for a year. The informed consent of the participants was obtained regarding the study. Ethical approval was not deemed relevant for this review.

Anthropometric methods

As a part of the study, the body analyses of the women were performed by a dietitian (a researcher). Tanita BC-418 body analysis monitor with a capacity of 200 kg and a precision of 100 gr was utilized for the body analyses. The participants were requested to keep only their underwear on while performing measurements, and to be on an empty stomach for at least 3 hours before they arrive for the measurements. The measurement for height was performed on bare foot, with no space between the feet, and head being in a Frankfort plane and arms hanging freely on the sides. A stadiometer (with a precision of 0.1 cm) fixed on the wall was used for the measurement (Holtain Ltd., UK). The Body Mass Index (BMI) (kg/m^2) was calculated by dividing the weight into the square of the height ^[14].

Regional slimming methods/devices

Three different regional slimming methods/devices were used.

First; Ultrasound & Radiofrequency (Exilis-2011, BTL Medical Devices) which uses ultrasound and radiofrequency waves.

Second; the cavitation method (Ultrasound Cavitation Eximia-2010, 1065 DJ Cosmo Plus) which uses cavitation ultrasound.

Third; Shock Wave Treatment (AWT Acoustic Wave Therapy D- Actor, ®200 by Storz Medical AG-Switzerland)

The radiofrequency devices are manufactured at the interval of 3-24 GHz for industrial, scientific and medical use. The radiofrequency energy reaches the target fatty tissue through heat. However, attention must be paid not to let the desired heat on the patient's skin exceed 45°C . Therefore, it requires a constant follow-up on the monitor. In addition, a cooler on the head piece cools the skin surface through contact, and preserves the skin texture ^[6].

The cavitation ultrasonication is a specific method as a combination of dermoelectroporation technology, which is already known, and a low ultrasound frequency. The cavitation ultrasound leads to an increase in tissue temperature thanks to its kinetic and vibrant characteristics, and to a contraction in collagen fibrillary, and a decrease in fat cells and thus some temporal splits in intracellular connections ^[15].

D-ACTOR ®200 by Storz Medical device is a system enabling acoustic waves to give a vibrant massage to the target tissue. Some shocks as air pressure are formed in a ballistic manner, and they affect the target tissue. The method is performed on the target tissue by putting on some ultrasound gel. The maximum energy level is 1.4- 5 bar ^[13,16].

Groups according to assessment criteria

All participants were divided into three groups depending on the regional slimming methods/devices (type of method) used; Participants who were applied Ultrasound & Radiofrequency (RF), participants who were applied Cavitation ultrasound (KWT), and Participants who were applied Shock Wave Treatment (AWT). The decision whether to apply a local method to the individuals was made upon the assessment by the doctor and the dietitian.

All participants were divided into three groups depending on the number of sessions of regional slimming methods; 2-5 sessions, 6-10 sessions and 11-15 sessions.

All participants were divided into two groups in accordance with their diet status. Thirty four individuals randomly selected out of all participants underwent a method for weight loss and were provided with a low-energy diet plan. The plan was drawn up by a dietitian taking into account of nutrition habits, and the individuals were informed about the importance of complying with the plan.

The research lasted for at least 5 weeks depending on the sessions of the method. The participants were put on a body analysis measurement twice. First measurement; a measurement prior to the outset of any method for weight loss Second (last) measurement; a measurement following the end of the method for weight loss. All participants were recommended to take a walk for at least 45 minutes 2-3 days a week.

Statistical analysis

Arithmetic average and standard deviation values were obtained for descriptive data pertaining to the participants, and frequency distributions were calculated. An analysis of variance on repeated measures was performed in an effort to identify, in terms of average and significance, the effect of the type of method (U&R, KWT, AWT), diet status and the number of sessions on the regional lipoidosis and muscle distribution.

Results

A total of 68 women with an average age of 33.8 ± 8.3 (17-55) participated in the study. All participants are individuals who joined the regional weight loss program intended for gluteal-femoral regions. 35.3% (24) of the participants work for the private sector. The occupational distribution of the participants is as follows: 11 students (26.2%), 8 civil servants (11.8%), 5 retirees (7.4%), 5 lawyers (7.4%), 2 nurses (2.9%) and 1 physician (1.5%).

The distribution of the participants is illustrated in Table 1 according to the type of method (regional weight-loss device), the number of sessions and diet status.

All participants fall within the group of overweight ($25\text{-}30 \text{ kg}/\text{m}^2$) according to the BMI assessment conducted prior to the study.

The effect of different methods for regional weight loss, diet status and the number of sessions in weight loss schedule on the regional fat and muscle distribution are illustrated in Table 2.

Table 1: The distribution of the participants according to their methods of weight loss, number of session and diet status.

Used methods	Session number	Those who diet	Those who don't diet	Total
U&R	1-5 session	9 (64.3%)		
	6-10 session	2 (40.0%)	3 (60.0%)	5 (100.0%)
KWT	1-5 session	2 (66.7%)	1 (33.3%)	3 (100.0%)
	6-10 session	3 (50.0%)	3 (50.0%)	6 (100.0%)
	11 session and over	2 (100.0%)	0 (0.0%)	2 (100.0%)
AWT	1-5 session	4 (44.4%)	5 (55.6%)	9 (100.0%)
	6-10 session	9 (36.0%)	16 (64.0%)	25 (100.0%)
	11 session and over	3 (75.0%)	1 (25.0%)	4 (100.0%)
Total		34 (50.0%)	34(50.0%)	68 (100.0%)

Table 2: The impact of three different variables (type of method, diet status and number of session) over body composition.

Body Composition	Used methods	df	F	p value
Body weight (kg)	Type of method	2	6.573	0.003*
	Dietary status	1	0.512	0.477
	Session number	2	0.564	0.572
	Type of method + dietary status	2	1.060	0.354
	Type of method + session number	3	2.271	0.091
	Dietary status+ session number	2	0.259	0.773
	Type of method + dietary status + session number	2	0.741	0.481
	Type of method	2	4.378	0.017*
	Dietary status	1	0.588	0.447
Waist circumference (cm)	Session number	2	0.685	0.509*
	Type of method + dietary status	2	0.511	0.603
	Type of method + session number	3	2.924	0.042*
	Dietary status+ session number	2	1.474	0.238
	Type of method + dietary status + session number	2	0.741	0.481
	Type of method	2	9.926	0.000*
	Dietary status	1	0.131	0.719
	Session number	2	0.026	0.974
	Type of method + dietary status	2	2.390	0.101
Hip circumference (cm)	Type of method + session number	3	3.484	0.022*
	Dietary status+ session number	2	3.534	0.036*
	Type of method + dietary status + session number	2	2.571	0.086
	Type of method	2	0.293	0.747
	Dietary status	1	0.198	0.658
	Session number	2	0.739	0.482
	Type of method + dietary status	2	0.360	0.699
	Type of method + session number	3	0.663	0.579
	Dietary status+ session number	2	0.443	0.644
Waist/Hip	Type of method + dietary status + session number	2	0.508	0.605
	Type of method	2	4.247	0.019*
	Dietary status	1	0.023	0.880
	Session number	2	0.192	0.826
	Type of method + dietary status	2	1.017	0.369
	Type of method + session number	3	2.135	0.107
	Dietary status+ session number	2	0.479	0.622
	Type of method + dietary status + session number	2	0.093	0.911
	Type of method	2	5.503	0.007*
BMI (kg/m ²)	Dietary status	1	3.105	0.084
	Session number	2	2.121	0.130
	Type of method + dietary status	2	0.521	0.597
	Type of method + session number	3	1.029	0.387
	Dietary status+ session number	2	1.409	0.253
	Type of method + dietary status + session number	2	1.674	0.197
	Type of method	2	7.327	0.002*
	Dietary status	1	1.785	0.187
	Session number	2	1.396	0.257
Total fat percentage (%)	Type of method + dietary status	2	0.883	0.420
	Type of method + session number	3	1.861	0.147
	Dietary status+ session number	2	0.926	0.403
	Type of method + dietary status + session number	2	1.760	0.182
	Type of method	2	7.327	0.002*
	Dietary status	1	1.785	0.187
	Session number	2	1.396	0.257
	Type of method + dietary status	2	0.883	0.420
	Type of method + session number	3	1.861	0.147
Total fat mass (kg)	Dietary status+ session number	2	0.926	0.403
	Type of method + dietary status + session number	2	1.760	0.182
	Type of method	2	7.327	0.002*
	Dietary status	1	1.785	0.187
	Session number	2	1.396	0.257
	Type of method + dietary status	2	0.883	0.420
	Type of method + session number	3	1.861	0.147
	Dietary status+ session number	2	0.926	0.403
	Type of method + dietary status + session number	2	1.760	0.182

	Type of method	2	2.728	0.075
	Dietary status	1	0.003	0.959
	Session number	2	0.611	0.547
Total fat free mass (kg)	Type of method + dietary status	2	0.942	0.396
	Type of method + session number	3	2.462	0.073
	Dietary status+ session number	2	0.266	0.767
	Type of method + dietary status + session number	2	0.261	0.771
	Type of method	2	7.030	0.002*
	Dietary status	1	2.695	0.107
	Session number	2	0.971	0.385
Right leg fat mass (kg)	Type of method + dietary status	2	0.478	0.623
	Type of method + session number	3	1.974	0.129
	Dietary status+ session number	2	0.334	0.718
	Type of method + dietary status + session number	2	1.800	0.175
	Type of method	2	1.775	0.179
	Dietary status	1	0.292	0.591
	Session number	2	0.107	0.898
Right leg fat free mass (kg)	Type of method + dietary status	2	0.964	0.388
	Type of method + session number	3	0.824	0.487
	Dietary status+ session number	2	0.692	0.505
	Type of method + dietary status + session number	2	0.386	0.682
	Type of method	2	7.471	0.001*
	Dietary status	1	2.122	0.151
	Session number	2	1.262	0.291
Left leg fat mass (kg)	Type of method + dietary status	2	0.864	0.427
	Type of method + session number	3	2.442	0.074
	Dietary status+ session number	2	0.399	0.673
	Type of method + dietary status + session number	2	1.395	0.257
	Type of method	2	2.194	0.122
	Dietary status	1	0.173	0.679
	Session number	2	0.150	0.861
Left leg fat free mass (kg)	Type of method + dietary status	2	1.128	0.331
	Type of method + session number	3	1.797	0.159
	Dietary status+ session number	2	0.440	0.646
	Type of method + dietary status + session number	2	0.150	0.861
	Type of method	2	6.064	0.004*
	Dietary status	1	1.611	0.210
	Session number	2	1.314	0.277
Trunk fat mass (kg)	Type of method + dietary status	2	0.821	0.446
	Type of method + session number	3	1.201	0.318
	Dietary status+ session number	2	1.055	0.355
	Type of method + dietary status + session number	2	1.639	0.204
	Type of method	2	2.709	0.076
	Dietary status	1	0.094	0.760
	Session number	2	0.934	0.399
Trunk fat free mass (kg)	Type of method + dietary status	2	0.623	0.540
	Type of method + session number	3	2.292	0.089
	Dietary status+ session number	2	0.295	0.746
	Type of method + dietary status + session number	2	0.640	0.532

* p<0.05

The type of the method led to a significant difference ($p<0.05$) between the first and the final measurement in terms of body weight, waist and hip circumference, BMI, total fat mass, right leg/left leg and trunk fat mass. There is no significant difference in total fat-free mass, right leg/left leg and trunk fat-free mass.

The number of sessions resulted in a significant difference only in waist circumference whereas it led to a significant difference ($p<0.05$) both in waist and hip circumference when combined with the type of method.

The diet status brought about a significant difference ($p<0.05$)

only in waist circumference when combined with the number of sessions.

Averages pertaining to some significant variables in the first and the final measurements are illustrated in the Table 3.

Discussion

The study pointed out that all types of the method led to a significant difference ($p<0.05$) between the first and the final measurement in terms of body weight, waist and hip circumference, BMI, total fat mass, right leg/left leg and trunk fat mass. There is no significant difference in total fat-free mass,

Table 3: Averages and variables with varying first and last measurements.

Variables		First measurement X ± SS	Last measurement X ± SS	p value
Body weight (kg)	Type of method	U&R	67.6 ± 11.4	0.003*
		KWT	81.1 ± 12.6	
		AWT	63.8 ± 8.9	
Waist circumference (cm)	Type of method	U&R	86.8 ± 8.8	0.017*
		KWT	98.7 ± 16.9	
	Session number	AWT	82.7 ± 9.1	
		1-5 session	88.9 ± 11.3	
		6-10 session	85.1 ± 11.7	
11 session and over	83.5 ± 15.3	83.0 ± 11.6		
Hip circumference (cm)	Type of method	U&R	104.5 ± 7.2	0.000*
		KWT	116.6 ± 11.2	
		AWT	100.7 ± 7.1	
BMI (kg/m ²)	Type of method	U&R	28.4 ± 0.0	0.019*
		KWT	28.4 ± 0.0	
		AWT	28.4 ± 0.0	
Total fat mass (kg)	Type of method	U&R	21.8 ± 6.9	0.002*
		KWT	31.5 ± 9.1	
		AWT	19.2 ± 5.9	
Right leg fat mass (kg)	Type of method	U&R	4.4 ± 1.1	0.002*
		KWT	5.9 ± 1.3	
		AWT	3.9 ± 0.9	
Left leg fat mass (kg)	Type of method	U&R	4.3 ± 1.1	0.001*
		KWT	5.9 ± 1.4	
		AWT	3.9 ± 0.9	
Trunk fat mass (kg)	Type of method	U&R	10.7 ± 3.8	0.004*
		KWT	15.3 ± 4.7	
		AWT	9.1 ± 3.4	

* p<0.05

right leg/left leg and trunk fat-free mass. It was pleasing to observe no loss in muscle tissue, yet it is safe to say that the exercise plan prescribed 2-3 times a week facilitated obtaining such positive result. The number of sessions resulted in a significant difference only in waist circumference whereas it led to a significant difference (p<0.05) both in waist and hip circumference when combined with the type of method. There are some findings pertaining to the parameters with significant difference between the first and the final measurements for each method. As indicated by these results, the fact that all methods led to a significant difference particularly around gluteal-femoral regions is a proof for the effectiveness of the methods adopted.

However, a significant difference was observed in the waist circumference as a result of all methods even though no method was directly performed around the waist. The number of sessions was, by itself, an effective indicator of the significant difference in the waist circumference.

It was found out that subcutaneous layer of fat significantly decreased around gluteal-femoral regions of 14 women who had undergone 8 sessions of AWT method for a period of four weeks [12]. Another study conducted regarding 25 women reported a significant decrease in fat mass and cellulite appearance in leg tissue which was applied AWT method [16], compared to leg tissue which was not.

Findings were reported indicating that the radiofrequency method, a widely-acclaimed method as an effective method, ensured slimming, and minimized wrinkles [17,18]. The analysis

performed through an electron microscope indicated that it enhanced the collagen production in tissue [6]. The radiofrequency method performed on 25 women aged 18 to 50 led to a decrease in the subcutaneous fatty tissue around gluteal-femoral regions, and to a regional contraction [19].

The strides made in beauty and weight loss sector have brought about fast foods with high energy. Some people, who struggle to give up on such foods, are in quest of losing weight without any limitation on their diet. A randomly selected group of participants was provided with an energy-restricted diet program. However, the diet status along with the regional weight-loss device yielded a significant difference (p<0.05) only around hip. The dietitian's analysis based on the results proved to be illustrative in regards to this study. According to the analysis, those opting for regional weight-loss devices consider the surplus of their body weight as a 'mere regional fat accumulation'. They believe that they can attain their objectives without any limitation on their diet when a method is performed through a special device on the region whose appearance they would like to change. It was striking to observe that the participants tended to wish to 'lose weight without any limitation on their diet' even though they were advised by the dietitian regarding the effectiveness of the diet on treatment, and re-appearance of fat layer. The fact that no difference was found between those on diet and those who were not raised a question about their commitment to the diet plan, and it appeared that gathering the participants in a camp during this process could contribute to have more control over the study in order to keep the diet factor under control. On the other hand, the fact that the participants in the study are overweight is a

positive factor to obtain favorable results through the methods. Further groups and studies are required to identify the effect of the study on individuals who are categorized as obese according to the BMI (BMI greater than 30 kg/m²).

Conclusion

Conducted with a view to identifying whether regional weight-loss devices have any effect on muscle and fat distribution particularly around regions they are used for, this study found no significant difference between the groups who went through and who did not go through an energy-restricted diet plan along with being treated with a regional weight-loss device. However, it was found out that the methods adopted contributed to a significant decrease in total body fat and regional fat mass of all participants.

Conflict of Interest

All authors disclose that there was no conflict of interest.

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