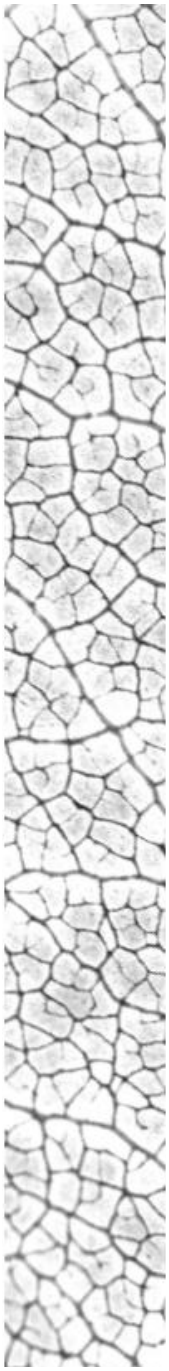

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Effect of ultrasound cavitation versus radiofrequency on abdominal fat thickness in postnatal women

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Abstract

Background: Overweight and obesity are predominant among women of conceptive age (25–34 years) with 42% having a BMI more than 25 kg/m^2. Weight gain builds the dangers of having diabetes and cardiovascular disease. The amount of weight gain postpartum can shift women from the healthy weight category into the overweight or obese BMI categories. **Purpose:** This study was conducted to compare the effectiveness of ultra-sound Cavitation versus radiofrequency on abdominal fat thickness on postnatal women. **Subjects and Methods**. Fifty overweight primipara women at 6 months postnatally aged from 20-35 years, BMI (25-29.9) kg/m^2 and have waist hip ratio (WHR) > 0.8. They were assigned randomly into 2 equal groups: Group (A) received ultra-sound cavitation 40 KHz applied for 30 minutes, once time weekly for 8 weeks. Group (B) received radiofrequency multi-polar (1 MHZ) applied for 30 minutes, once time weekly for 8 weeks. Both groups got a similar diet program all through the treatment period. All females in both groups were assessed through weight scale for body weight, tape measurement for waist/hip ratio and ultra-sonography for fat thickness of the abdominal area pre and post treatment program. **Results**: showed that there was a significant reduction of body weight, abdominal fat thickness at three level (at the umbilicus level, above and below umbilicus by 5 cm) in both groups with favorable results for group A. With a significant reduction of waist/hip ratio in group A only. **Conclusion:** Ultrasound cavitation and radiofrequency are effective strategies for the treatment of abdominal obesity, however US cavitation are more effective than RF in reduction of WHR and abdominal fat thickness in abdominal obese in postnatal ladies.

Keywords: ultra-sound cavitation, radiofrequency, abdominal fat thickness, postnatal women

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INTRODUCTION

Obesity or being overweight are almost identifying simply as a syndrome of abnormal or excessive fat accumulate in the adipose tissue to the extent that health may be declined, whereas the central obesity or the abdominal adiposity denotes excessive fat in the middle body region, more of it in the intra-abdominal area (Lin et al. 2012).

Excessive gestational weight retention builds the danger of postpartum weight gain and long-term maternal weight retention, it has been proposed to abdominal obesity, which may expand a lady's danger of both cardiovascular diseases and metabolic syndrome (Nehring et al. 2011).

Pregnancy is also related to increases of the fat mass thickness at the abdominal region. Fat is gained on both the central and lower body during pregnancy (Gunderson et al. 2008). During postnatal period, the visceral (or intra-abdominal) fat is more metabolically active than fat depots in other body areas and is linked to a more adverse cardiometabolic profile. That, the visceral fat is related to an increased risks of cardiovascular diseases, diabetes, and the metabolic syndrome (Fox et al. 2009).

Diminishing body fat is turning into a significant issue in current society because of unevenness between high caloric admission and absence of the activity. Extra fat tissue keeping around the abdominal region, the breasts

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and the lower limbs leads to individual disappointment with body constitution and resulting interest for viable, sheltered and straightforward medicines for body contouring. Generally, liposuction was the most well-known strategy for body shaping however this obtrusive treatment has been related with numerous antagonistic occasions and complexities (Triana et al. 2009; Venkatanagaraju, & Divakar, 2015).

RF and ultrasound cavitation are safe and effective noninvasive technology methods for mobilizing local fat deposits. They are less invasive and have fewer complications compared to the liposuction traditional treatments (Shek et al. 2009).

Ultrasonic lipolysis waves can make evacuation of the undesirable body fat that affidavit without negative impact on the skin. Decrease of the intercellular pressure in the fixed temperatures brings about the advancement of a huge number of micron bubbles which prompts emotional blast of the last because of rehashed patterns of extension and shrinkage (Coleman et al. 2009).

This procedure produces a lot of energy that interference the adipose cell walls and discharges its lipid content which is at last channel them to the hepatobiliary framework by means of the lymphatic drainage. This framework which is named “Cavitation” is conjectured to bring about a lessening of the local fat tissue volume (Hotta et al. 2010).

Radiofrequency is an electromagnetic wave that was at first utilized for rewarding the periorbital wrinkles, rhytids and the skin laxity. Today RF is broadly utilized for body chiseling, skin fixing and cellulite treatment (Araujo et al. 2015).

(RF) is usually utilized for expanding further skin temperature with no epidermal or dermal removal. It isn’t just utilized as a proficient technique for contracting or initiating skin fixing yet additionally as a compelling strategy for decreasing fat in redundancy (Weiss 2013).

PARTICIPANTS AND METHODS

Study design

The study was designed as a randomized controlled trial. Ethical approval was obtained from the Institutional Review Board of the Faculty of Physical Therapy, Cairo University, before starting of the study (no: P.T.REC/012/001970) and the Clinical trial registration in Clinicaltrial.gov with an identifier number NCT04452552 The study followed the guidelines of Declaration of Helsinki on the conduct of human research.

Participants

Fifty patients overweight primipara women at 6 months postnatally had participated in this study. They had selected from the outpatient clinic of the family planning, Obstetrics and Gynecology of Fayoum Teaching University Hospital. Their age were ranged from 20 to 35 years, their body mass index BMI 25–29.9 kg/m^2 and their waist hip ratio (WHR) > 0.8. The duration of the study was continued 6 months (from July to December 2019). The women were excluded from this study if they had heart disease, high cholesterol, liver as well as kidney diseases, diabetes mellitus, hypertension, taking oral contraceptives or weight loss medications and pregnancy were excluded from the study.

Randomization

An independent person randomly assigned to all participated subjects to either group (A) (n=25) or group (B) (n=25) by chosen numbers from closed envelopes having numbers that the number generator was chosen randomly, and the patients were allocated accordingly to their groups.

Group (A): Composed of 25 overweight primipara women, received ultrasound cavitation treatment sessions on their abdominal region once per week in addition to balanced diet program which ranged from 1600 kcal to 2000 kcal/day, which was calculated in an individual basis for each woman according to her basal metabolic rate (BMR) for 8 weeks. **Group (B):** Composed of 25 overweight primipara women, received radiofrequency treatment sessions on their abdominal region once per week in addition to the same program of diet prescribed for group (A) for 8 weeks**.**

Methods

Ultrasound cavitation (for only participants of group A): 25 overweight primipara women.

Ultrasound-Cavitation: Mable6 Duo Ultra cavitation **+** Multipolar RF system. Produced by DAEYANG MEDICAL company, made in Korea. Power input (AC100/ 240V). Ultrasonic cavitation**:** Output frequency: 40 KHz, Power: 45W, hand probe diameter: 5.0 cm. Multipolar RF with output frequency (1 MHZ).

Ultrasound cavitation procedures

1) Clean the skin with alcohol cotton.
2) From standing position, the abdominal area of every woman divided vertically into 2 sections right and left segment on the abdominal area which expanding bilaterally from the line stretching out from the mid axilla to the iliac crest, and above from center of diaphragm to the line extending between two iliac crest below.
3) Patient was placed into a comfortable supine lying position.
4) Application of conductive gel on the area to be treated. The cavitional head was moved very slowly on each abdominal segment in small circular movement.
5) Application treatment of ultrasound cavitation for approximately 15 minutes on each side of abdomen, duration of each session was 30 minutes.

6) Cavitation frequency 40 KHz, Power: 45W and treatment was applied once time per week for 8 sessions (Scorza et al. 2008, Saber et al. 2013).

Radiofrequency (for only participants of group B): The other 25 overweight primipara women.

Radiofrequency: (Mable6 Duo Ultra cavitation **+** Multipolar RF system) machine.

Multipolar mode RF with output frequency (1 MHZ).

Procedures of Radiofrequency Application

1) Patient was placed into a comfortable supine lying position. The treated area cleaned the skin with alcohol cotton.
2) The treatment was applied one time every week for 8 sessions.
3) Apply RF using the head on spot fat areas, on same landmarked of cavitation site in group (A), the applicator was employed with slight pressure in a continuous sweeping movement over the skin.
4) Application treatment of RF for approximately 15 minutes on each side of abdomen, Treatment duration was 30 minutes in each session (Khan et al. 2010).

Diet program

All participants in both groups (A and B) received the same diet program throughout the treatment period (for 8 weeks) in form of balanced diet program which ranged from 1600 kcal to 2000 kcal/day, carbohydrates account for 45 to 65%, proteins for 10 to 35%, and lipids for 20 to 35% of total calorie intake, which was calculated in an individual basis for each woman according to her basal metabolic rate (BMR) (Eastwood, 2013).

Estimation of the woman's energy requirements (Diet)

The woman's energy requirements were calculated in two steps: to maintain the weight, utilize the Harris-Benedict principle and formula below to evaluate the **basal metabolic rate** (BMR) (Santos et al. 2011).

Step 1- Basal metabolic rate (BMR):

For every woman: 665 **+** (9.6 x weight in kg) **+** (1.8 x height in cm) **–** (4.7 x age in years).

Step 2 - Applying the Harris-Benedict Principle:

By the following table can enable estimated value is then multiplied by a number that corresponds to the person's activity level. The resulting number is the recommended daily calorie intake to maintain current weight (Santos et al. 2011).

Sedentary	Daily kilocalories needed = BMR x 1.2
Mild activity level	Daily kilocalories needed = BMR x1.375
Moderate activity level	Daily kilocalories needed = BMR x 1.55
Heavy activity level	Daily kilocalories needed = BMR x 1.725
Extreme activity level	Daily kilocalories needed = BMR x 1.9

Outcome measures

A- Assessment procedures: The study protocol was explained to all women, who had signed an informed consent form.

1) *BMI calculation*

The woman's BMI had calculated from measured weight & height for each woman in both groups (A&B) before beginning of the study and weight only had measured after 8 weeks of treatment sessions to according to the following equation: **BMI=weight (Kg) /height (m^2)** (Flegal et al. 2014).

2) *Waist to hip ratio Measurement procedures*

WC was measured at the level of the top of the right iliac crest. The measuring tape ought to be snug per skin yet not compressing and held corresponding to the floor. HC was estimated at the most extreme circumference at the level of femoral trochanter. At that point WHR was determined by partitioning WC on HC. The two estimations were taken for all ladies in all gatherings (A and B) before beginning and after 8 weeks of treatment sessions (after the end of study). All measurements were taken while the women in the standing position. Skin of the anterior abdominal wall was cleaned while the woman in hip circumference worn light clothes and sometimes measurements repeated twice for more accurate. That measured WC, HC to measure (WHR) calculated by dividing the measurement of the waist by the measurement of the hips.

WHR= (waist circumference / hip circumference) (Jensen 2006).

3) *Measurements Abdominal fat thickness: by using* Ultrasound diagnostic:

Xario Toshiba made in Japan ultrasound Machine was utilized to quantify the abdominal fat thickness for all ladies in two groups (A & B) before beginning and after the end of 8 weeks of the treatment sessions. Investigation medical ultrasound have been utilized to assess the thickness of the abdominal fat layer at the affected region comparable to a fixed point for each measurement. Measurement was carried out by the similar investigator (was done by radiology specialist). With the patient in relaxed supine lying position the area to be examined was uncovered and the gel was applied over it. Estimation of fat thickness at the level, above and beneath the umbilicus were registered (around umbilicus by 5 cm). The scan was attained and transferred to the monitor screen (Rallan and Harland, 2003).

Statistical analysis

Statistical analysis was conducted using SPSS for windows, version 22 (SPSS, Inc., Chicago, IL). Descriptive analysis using histograms with the normal distribution curve showed that weight, waist and hip circumference, waist/hip ratio, subcutaneous fat thickness at level, 5 cm above and 5 cm below umbilicus were normally distributed and not violates the parametric assumption for the measured dependent variable. Additionally, testing for the homogeneity of covariance revealed that there was no significant difference with p values of > 0.05. The box and whiskers plots of the tested variable were done to detect outliers. Normality test of data using Shapiro-Wilk test was used, that reflect

Table 1. Physical characteristics of patients in both groups (A&B)

Items	Group A	Group B	Comparison		
	Mean ± SD	Mean ± SD	t-value	P-value	S
Age (years)	26.32±3.26	26.28±3.19	0.044	0.965	**NS**
Height (cm)	162.43±4.03	160.28±4.24	1.799	0.079	**NS**
BMI (kg/m^2)	28.42±0.68	28.32±0.9	0.459	0.648	**NS**

*SD: standard deviation, P: probability, S: significance, NS: non-significant.

Table 2. Mean ±SD and p values of weight pre-and post-test at both groups (A&B)

Weight	Pre test	Post test	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	75.8±5.04	68.12 ±4.59	7.68	10.13 %	0.0001*
Group B	75.52 ±4.61	70.52±4.63	5	6.62 %	0.0001*
MD	0.28	-2.4			
p- value	0.839	0.072			

*Significant level is set at alpha level <0.05 SD: standard deviation
MD: Mean difference p-value: probability value

Table 3. Mean ±SD and p values of waist circumference pre-and post-test at both groups (A&B)

Waist circumference	Pre test	Post test	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	94.16±6.43	86.2 ±5.92	7.96	8.45 %	0.0001*
Group B	93.52 ±5.62	91.2±5.48	2.32	2.48 %	0.0001*
MD	0.64	-5			
p- value	0.71	0.003*			

*Significant level is set at alpha level <0.05 SD: standard deviation
MD: Mean difference p-value: probability value

the data was normally distributed for all dependent variables. Accordingly, 2×2 mixed design MANOVA was used to compare the tested variables of interest at different tested groups and measuring periods. With the initial alpha level set at 0.05.

RESULTS

Physical Characteristics of the patients in both groups (A & B)

Table 1 shows no significant differences in the mean values of age, height and BMI between both tested groups (A&B) at the beginning of the study (P=0.965, 0.079, and 0.648, respectively).

Effect of treatment on all dependent variables

Multiple pairwise comparisons (within and between groups) for each variable:

Weight

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of the body weight at post treatment in compare to pre-treatment (P-value =0.0001*).

Considering the effect of the tested group (first independent variable) on body weight, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the “pre” test between both groups (A&B) showed no significant differences with (P=0.839). As well as, multiple pairwise comparison tests (Post hoc tests) revealed that there was no significant difference of the mean values of the “post” test between both groups (A&B) with (p=0.072). In spite of there was no statistical significant difference between group A and group B, there was clinical difference and high percent of improvement in favor to group A (**Table 2**).

Waist circumference

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of the waist circumference at post treatment in compare to pre-treatment (P-value =0.0001*).

Considering the effect of the tested group (first independent variable) on waist circumference, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the “pre” test between both groups (A&B) showed no significant differences with (P=0.71). As well as, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the “post” test between both groups (A&B) with (p=0.003*) and this significant reduction in favor to group A (**Table 3**).

Hip circumference

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of hip circumference at post treatment in compare to pre-treatment (P-value =0.0001*).

Considering the effect of the tested group (first independent variable) on hip circumference, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the “pre” test between both groups (A&B) showed no significant differences with (P=0.639). As well as, multiple pairwise comparison tests (Post hoc tests) revealed that there was no significant difference of the mean values of the “post” test between both groups (A&B) with (p=0.684). In spite of there was no statistical significant difference between group A and group B, there was clinical difference and high percent of improvement in favor to group A (**Table 4**).

Table 4. Mean ±SD and p values of hip circumference pre-and post-test at both groups (A&B)

Hip circumference	Pre test	Post test	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	107.48±7.04	103.8 ±6.51	3.68	3.42 %	0.0001*
Group B	106.56 ±6.74	104.56±6.6	2	1.87 %	0.0001*
MD	0.92	-0.76			
p- value	0.639	0.684			

*Significant level is set at alpha level <0.05 SD: standard deviation
MD: Mean difference p-value: probability value

Table 5. Mean ±SD and p values of Waist / hip ratio pre-and post-test at both groups (A&B)

Waist / hip ratio	Pre test	Post test	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	0.874±0.013	0.82 ±0.017	0.054	6.17 %	0.0001*
Group B	0.873 ±0.012	0.86±0.014	0.013	1.48 %	0.051
MD	0.001	-0.04			
p- value	0.913	0.0001*			

*Significant level is set at alpha level <0.05 SD: standard deviation
MD: Mean difference p-value: probability value

Table 6. Mean ±SD and p values of Fat thickness at level of umbilicus pre-and post-test at both groups (A&B)

Fat thickness at level of umbilicus	Pre test	Post test	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	34.16±3.38	25.52 ±3.24	8.64	25.29 %	0.0001*
Group B	34.4 ±3.16	30.64±3.06	3.76	10.93 %	0.0001*
MD	-0.24	-5.12			
p- value	0.797	0.0001*			

*Significant level is set at alpha level <0.05 SD: standard deviation
MD: Mean difference p-value: probability value

Table 7. Mean ±SD and p values of Fat thickness above level of umbilicus by 5 cm pre-and post-test at both groups (A&B)

Fat thickness above level of umbilicus by 5 cm	Pre test	Post test	MD	% of change	p- value
	Mean± SD	Mean± SD			
Group A	29.76±2.58	24.48 ±2.53	5.28	17.74 %	0.0001*
Group B	30.36 ±2.48	28.32±2.47	2.04	6.71 %	0.0001*
MD	-0.6	-3.84			
p- value	0.407	0.0001*			

*Significant level is set at alpha level <0.05 SD: standard deviation
MD: Mean difference p-value: probability value

Waist/hip ratio

Multiple pairwise comparison tests (Post hoc tests) revealed that there was no significant difference of waist/hip ratio at post treatment in compare to pre-treatment (P-value =0.051).

Considering the effect of the tested group (first independent variable) on waist/hip ratio, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the “pre” test between both groups (A&B) showed no significant differences with (P=0.913). As well as, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the “post” test between both groups (A&B) with (p=0.0001*) and this significant reduction in favor to group A (**Table 5**).

Fat thickness at level of umbilicus

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of fat thickness at level of umbilicus at post treatment in compare to pre-treatment (P-value =0.0001*).

Considering the effect of the tested group (first independent variable) on fat thickness at level of umbilicus, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the “pre” test between both groups (A&B) showed no significant differences with (P=0.797). As well as, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the “post” test between both groups (A&B) with (p=0.0001*) and this significant reduction in favor to group A (**Table 6**).

Fat thickness above level of umbilicus by 5 cm

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of fat thickness above level of umbilicus by 5 cm at post treatment in compare to pre-treatment (P-value =0.0001*).

Considering the effect of the tested group (first independent variable) on fat thickness above level of umbilicus by 5 cm, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the “pre” test between both groups (A&B) showed no significant differences with (P=0.407). As well as, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the “post” test between both groups (A&B) with (p=0.0001*) and this significant reduction in favor to group A (**Table 7**).

Table 8. Mean ±SD and p values of Fat thickness below level of umbilicus by 5 cm pre-and post-test at both groups

Fat thickness below level of umbilicus by 5 cm	Pre test Mean± SD	Post test Mean± SD	MD	% of change	p- value
Group A	31.68±2.98	25.8 ±2.64	5.88	18.56 %	0.0001*
Group B	31.8 ±2.62	29.04±2.44	2.76	8.67 %	0.0001*
MD	-0.12	-3.24			
p- value	0.881	0.0001*			

*Significant level is set at alpha level <0.05 SD: standard deviation
MD: Mean difference p-value: probability value

Fat thickness below level of umbilicus by 5 cm

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of fat thickness below level of umbilicus by 5 cm at post treatment in compare to pre-treatment (P-value =0.0001*).

Considering the effect of the tested group (first independent variable) on the fat thickness below level of umbilicus by 5 cm, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the "pre" test between both groups (A&B) showed no significant differences with (P=0.881). As well as, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the "post" test between both groups (A&B) with (p=0.0001*) and this significant reduction in favor to group A (**Table 8**).

DISCUSSION

The results of the present study showed that there was a significant reduction of the body weight and the abdominal fat thickness after the treatment program in both groups (A&B) but, a significant reduction of the waist hip ratio in group (A) Only (P-value =0.0001*) after application of the ultrasound cavitation. While, group (B) revealed that there was no significant difference of Waist/hip ratio at post treatment values of radiofrequency in compare to pre-treatment values (P-value =0.051).

By comparison between post treatment values of the body weight, waist/hip ratio and the abdominal fat thickness at the level, above and underneath the umbilicus demonstrated significant difference between both groups with favorable results for group A.

Regarding the results of body weight, there was statistically significant decrease of the body weight in both groups A and B with percentage of improvement (10.13 % and 6.62 %) respectively with statistically non-significant difference between both groups A and B after the treatment application. Regarding the results of waist/hip ratio, there was statistically significant decrease of waist/hip ratio in both groups A and B with percentage of improvement (6.17 % and 1.48%) respectively. Regarding the results of the fat thickness at the umbilicus level, there was statistically significant decrease of fat thickness at the umbilicus level in both groups A and B with percentage of improvement (25.29 % and 10.93%) respectively. Regarding the results of the fat thickness above umbilicus, there was statistically significant decrease of the fat thickness above the umbilicus in both groups A and B with percentage of improvement (17.74 % and 6.71%) respectively. Regarding the results of fat thickness below the umbilicus, there was statistically significant decrease of fat thickness below the umbilicus in both groups A and B with percentage of improvement (18.56 % and 8.67%) respectively.

Regarding the results of present study in group (A) that are can be credited to the mechanism of the fat cell destruction in which ultrasound-induced cavitation was appeared to cause particular fat cell decrease without interruption to the skin, vessels, nerves, or the connective tissue. Like the present findings, ultrasound treatment was accounted for to actuate the development of different little bubbles in the adipocytes, permitting disintegration of triglycerides into the interstitial space and the lymphatic systems (Garcia et al. 2013). It is can drain them, that triglycerides would then be able to be absorbed and used by the endogenous lipases that alternated into glycerol and free fatty acids and consolidated in the total lipoprotein pool. Of note, serum lipids were unaltered or somewhat expanded, yet at the same time inside the normal range (Moreno-Moraga et al. 2007).

That energy discharged from the ultrasound wave is in the form of heat (minimal effect) and pressure waves (major effect). As lipid cells membranes do not have the structural ability to withstand such vibrations, the impact of cavitation easily effectively breaks them while saving vascular, nervous and muscular tissue (Murray et al. 2005).

Likewise, the results of this investigation came in concurrence with the investigation of Sabbour and El-Banna, (2009) that was led to decide the proficiency of cavitation ultrasound treatment in lessening of the visceral adiposity in fifty premenopausal obese ladies with their BMI ranged between 31.5 and 40.04Kg/ m^2, WHR between 0.9 and 0.95% and waist circumference in the range of 89 and 108 cm. Group A followed low-calorie diet alone. While, group B got cavitation ultrasound treatment on the abdominal area and followed a low-calorie diet. The aftereffects of this examination affirmed that the mixture of cavitation ultrasound treatment and low-calorie diet portrayed by a higher productivity than a low-calorie diet alone in

bringing down the anthropometric, complete body arrangement and plasma liopoprotein factors.

These outcomes are steady with the consequences of Hamideh et al. (2015), in their published investigation of ultrasonic lipolysis (cavitation) on the abdominal area by decrease of the waist circumference. Twenty-eight females (age: 37.8 ± 8 years) with local abdominal obesity experienced. Subjects were assessed utilizing estimations of outline when last treatment. The lipolysis procedure was done with twofold transducer hand piece which conveys centered ultrasonic waves to the fat tissue underneath the skin. The duration went on for 30 to 45 minutes a limit of 8 sessions with frequencies of 20 Hz to 60 Hz and at powers of 0.5 to 3 w/cm^2 relying upon the patient's temperature resistance 28 subjects. A statistically significant (P <.001) average of 1.89 cm reduction of the waist circumference value was seen in every session of the ultrasonic lipolysis. The mean pretreatment to post-treatment circumference decrease was 8.21 cm.

Besides, the outcomes validate those from Jewell et al. (2012), who carried out a sham-controlled, randomized trial to assess the safety, decency, and adequacy of HIFU for body contouring. The patients were haphazardly allocated to treatment of their anterior abdomen and flanks with three passes of 47 J/cm^2 (141 J/cm^2 total), 59 J/cm^2 (177 J/cm^2 total), or 0 J/cm^2 (0 J/cm^2 total). Patients who got 141 J/cm^2 demonstrated a normal decrease of the waist circumference of 2.1 cm 12 weeks after the treatment. Patients treated with 177 J/cm^2 had an average reduction of 2.52 cm while those in the control group averaged a 1.21 cm decrease with no serious unfavorable occasions were accounted for.

Also the result comes in agreement with a retrospective study by Fatemi and Kane, (2010) with 85 participants (57 females and 28 males with a mean age of 43.8 years). Showed similar findings at ≤ 16-week fellow-up. Mean energy level of the HIFU device was 134.8 J/cm^2 and the treatment session duration ranged from 60 to 90 minutes. The average reduction in the waist circumference was 4.6 cm, 12 weeks after treatment.

What's more, Shek et al. (2014), Who completed a single center prospective study by utilizing the ultrasound cavitation on 12 Chinese participants (nine females and three males, with a mean age of 39.5 years). Who experienced single treatment on their anterior abdominal wall. Subjects with BMI ≤ 30 kg/m^2 and subcutaneous adipose tissue ≥ 2.5 mm in the targeted zone were enlisted in the examination. The normal diminishing of the waist circumference was 1 cm at the 12th week follow-up.

Moreover, our outcomes certify those from Moreno-Moraga et al. (2007), who led an investigation was to survey the adequacy and safety of the ultrasound cavitation system on thirty patients. Every patient experienced three treatments at 1-month spans. Regions treated were the abdomen, inner and outer thighs, flanks, inner knees, and male breasts. The Ultrasound estimations and circumference estimations were utilized to survey changes in fat thickness. This investigation demonstrated the viability and wellbeing of ultrasound cavitation (USC) as a non-intrusive transdermal technique for lessening undesirable fat stores in the body.

An ongoing report completed by Wallner et al. (2013), affirmed that, the utilization of subcutaneous adipose tissue topography (SAT-Top) is more competent than BMI in evaluating the obesity in physically active individuals and youthful grown-ups. These outcomes recommend that subcutaneous fat patterns are a superior screening device to portray fatness in physically active young individuals.

On the other hand, our outcomes are in inconsistency with Shek et al. (2009), who examined the wellbeing and adequacy of this focused ultrasound device in body shaping in Asians on fifty-three patients. The general fulfillment between the patients was poor. Objective estimations by ultrasound, abdominal circumference, and caliper did not show significant difference after treatment didn't show noteworthy contrast after treatment. There was a negative connection between the abdominal fat thickness and the shots number per treatment session. Such perception is likely because of littler body figures. Structure adjustments can beat this issue and in doing as such, improve clinical result.

Likewise, Nazanin and Michael, (2013) recorded the negative impacts of ultrasound cavitation involved mild to moderate, ecchymosis, discomfort and edema.

The results of present study in group (B) that are discoveries can be ascribed to the activity of radiofrequency. The instrument activity of radiofrequency waves on fat reason local extra dermal warming and increment the dissemination in the skin causing collagen fibrillar denaturation and redesigning. These progressions may bring about the skin tightening and cellulite improvement. RF heat likewise has an effect on the digestion of adipocytes apoptosis and decreasing adipocyte volume (Afrooz et al. 2011).

Additionally, the consequence of this investigation came in concurrence with investigation of Emilia et al. (2006), who surveyed the impacts of applying RF on subcutaneous fat of the posterior and thighs of 26 female subjects (ages 18 to 50 years). Two treatment sessions, two weeks separated were thought of. They utilized constant-time scanning image ultrasound for estimating the separation between the dermis and the camper's fascia, and their findings demonstrated that controlled tissue heating with RF could diminish the thickness between the dermis and the fascia. The average decrease in thigh and buttocks were 2.64 and 1.8 mm, respectively. Understanding the effect of treatment sessions from changes on the skin surface and clothing

leads to patient's satisfaction with the methodology and was surveyed by the examining gathering.

RF is a safe and effective strategy for diminishing body circumferences and lessen the sagging skin in the postpartum period (Brightman et al. 2009).

Radiofrequency field is made out of both electrical and magnetic segments (Lolis and Goldberg, 2012). The RF frequency is inversely proportional to the of penetration depth. It is known that the lower frequencies RF having higher rates of penetration. The penetration depth of 40 MHz frequency will stay superficial contrasted with that of a 1MHz frequency (Belenky et al. 2012).

Finally, multipolar devices work comparatively to the bipolar ones however comprise of at least three electrodes. One electrode keeps up a positive charge while the others convey negative charges. Electrodes alternate among the positive and negative charges to abstain from overheating. These devices permit a larger volume to be warmed with less inconvenience (Jiménez-Lozano et al. 2013).

Likewise, the aftereffect of this examination came in concurrence with Pumperla et al. (2015), who assessed the quick and continued impacts of RF treatment on the cardiovascular autonomic function, the metabolism parameters and the anthropometric parameters. Toward the finish of 4 sessions, RF treatment was related with a critical decrease in the abdominal circumference ($p < 0.001$). Likewise, Goldberg et al. (2008), who showed that multipolar Radiofrequency alone is innovation that gave helpful impacts on the decrease of mid-region and thigh boundaries and a general improvement in the presence of cellulite.

Venus Freeze is a multipolar radiofrequency, which uses pulsed electromagnetic field that activate the fibroblast proliferation, the angiogenesis (new collagen), and collagen synthesis in a nonthermal way (Sadick et al. 2014). EndyMed PRO™ 3 (3DEEPR) is an innovation, utilizing the multipolar radiofrequency with real-time skin protection readings hand pieces for the facial and the body sites (Harth 2015).

Radiofrequency could expand the local blood stream, up controlling the local adipose metabolism, and is able of invigorating lipase-mediated degradation of triglycerides or even adipocytes apoptosis (Levy et al. 2016). Delayed impacts incorporate thermal instigated microinflammatory reaction in the skin tissue prompting neocollagenesis, which is the aftereffect of the dermal remodeling to decay damaged collagen by the collagenase enzyme, and replace it with a new collagen (Dunbar and Goldberg, 2015).

In like manner, Malerich et al. (2014), who utilize the multipolar RF and PEMF (pulsed electromagnetic field) device can give good outcomes for treating photoaged skin and cellulite. This consolidated innovation is not the same as the utilization of radiofrequency alone, as it conveys RF vitality with the all the while expansion of beat electromagnetic field. The synchronized treatment permits the conveyance of more energy to the treated area, accomplishing higher temperature with minimal hazard and pain, keeping up the epidermis intact, and prompting less symptoms and shorter recovery periods.

The results of the current study are in consistence with Adatto et al. (2014), who recorded a progressive decrease in the patient circumferences by utilizing the diagnostic US and cutometer, respectively. When apply radiofrequency (RF) on the thickness of the fat layer showed on average a 29 % decrease among the baseline and the 1-month follow up. The normal decrease in the circumference of the abdomen/flanks, buttocks and thighs from the standard to the 3-month follow-up was 1.4, 0.5, and 1.2 cm, respectively, and 93 % of study participants showed a 1–60 % advance in the fat layer thickness. Patients abstractly portrayed comfort and fulfillment from the treatment and 97 % of them were satisfied with the outcomes at the subsequent visit.

Likewise, it comes in concurrence with, Manuskiatti et al. (2003), who assessed the impacts of a tripolar RF technology on the abdomen and thigh circumferences. The subjects got eight treatment sessions, seven days separated with no adjustment in their physical action and diet. A month after the last treatment session, the examination demonstrated huge outline decrease of the abdomen and thigh areas. By and by, there was no noteworthy decrease in buttocks and arms.

On the other hand, our outcomes are in inconsistency with, study by Paul and Mulholland, (2009) who reported the effect of the RF produced heat in the induction of collagenesis and elastogenesis, with the subsequent remodeling occurring during the treatment and for a considerable length of time after the application. While the impacts of RF on the skin retraction, subdermal tissue and subcutaneous tissue tightening are minimal impact as undisputed, many studies portrayed as limitations. The thermal impacts of unipolar and bipolar and multipolar RF were demonstrated valuable in skin tightening even so.

Additionally, are in inconsistency with Harth and Lischinsky, (2011) who hypothesis for the need or unpredictability of the capability of RF systems is the difficulty to adjust the power conveyed to various individual skin impedances.

Also, in a clinical preliminary trial by Ruiz-Esparza et al. (2003), who reported nearly of patients encountered some level of constriction of sagging skin coming about because of the treatment with a RF device.

Finlay in this investigation that radiofrequency is an adaptable strategy that can be utilized on any area of the body from large regions like the abdomen to a very small regions, for example, the chin with the variable level of progress as per RF devices. Individuals who are not considered overweight yet have difficult pockets undesirable fat that are not reacting to abstain from food

and exercise, radiofrequency is very useful. Our consequences of this investigation are consistent with Fajkošová et al. (2014), who affirmed selective RF body contouring is a perfect procedure for the patients who need moderate amounts of adipose tissue removal after some time utilizing single or various treatments or who in any case would not be considered for enormous volume liposuction strategies.

These outcomes are likewise consistent with the consequences of Mohamed et al. (2015), in their published study to compare among cavitation with radiofrequency and mesotherapy on abdominal adiposity. Body weight, height, waist hip ratio and skin fold were estimated before and after the intervention. Results indicated a noteworthy improvement in the three gatherings in the waist circumference, waist hip ratio, and suprailiac skin fold in favor of cavitation radiofrequency groups, with no significant difference in the body weight and BMI in the three gatherings after intervention.

CONCLUSION

It can be concluded from this study that US cavitation and multipolar RF could be utilize for management of abdominal obesity, but US cavitation more effective than RF Lipolysis in reduction of waist/hip ratio and subcutaneous fat thickness in management of the abdominal obesity in postnatal women.

RECOMMENDATIONS

It is recommended to add US cavitation and multipolar RF for management of the abdominal obesity in postnatal women.

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