Multidimensional Evaluation of Phosphatidylcholine Mesotherapy in Cellulite Management

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ABSTRACT

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ellulite is a common disorder affecting subcutaneous tissue, particularly in the thighs, hips, and buttocks, accompanied by changes in skin topography. Phosphatidylcholine (PPC) mesotherapy is performed to reduce the appearance of cellulite through intradermal injections targeting local subcutaneous fat. The search aimed to evaluate the lipolytic effect of phosphatidylcholine mesotherapy on cellulite treatment in the buttocks and upper thigh regions. Patients and Methods: A low-calorie diet, exercise, and PPC mesotherapeutic injection were administered weekly for six weeks in group 1. A low-calorie diet and exercise were applied to group (2). Both groups were assessed before and after the study for anthropometric parameters, including weight, BMI, and circumferences (Waist circumference, hip circumference, and waist-hip ratio), cellulite grade, laboratory evaluation, digital cellulite photographs, and musculoskeletal ultrasonic fat thickness measurements (MSUS). After the study, both groups showed statistically significant reductions in anthropometric parameters, lipid profile, and fasting blood sugar (p <0.001 for each group), with a greater reduction in Group 1. A significant decrease in cellulite grading was observed in Group 1 compared to Group 2 (p=0.006), with improvements in cellulite grades relative to baseline (p<0.001 for Group 1 and p=0.046 for Group 2). A reduction in ultrasonographic fat thickness measurements in the buttocks and upper thigh was noted in Group 1 (p < 0.001 for both sides). Conclusion: PPC mesotherapy is safe and provides a non-surgical option for cellulite management. PPC leads to multidimensional improvement, with reductions in anthropometric parameters, MSUS fat thickness, and cellulite grade.

Keywords: Cellulite, Mesotherapy, Phosphatidylcholine, PPC, injection lipolysis.

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INTRODUCTION

Cellulite is a dermatological characterized condition bv topographic changes of the skin, especially in areas of greater fat storage. Clinically, the topographic changes manifest as dimpling, denting, or nodulation, causing an uneven skin surface (Gabriel et al., 2023). Thighs, hips, and buttocks are the most commonly affected areas by cellulite (Amuso et al., 2024). It develops in the most superficial layer of the three fat lavers that lies beneath dermis and epidermis, which is known as the hypodermis or subcutaneous fat layer (Daniello and Malik, 1998), Although cellulite can affect any age post puberty, it mostly appears between the ages of twenty and thirty (Arora et al., 2022). Cellulite remains a multifaceted entity with a complex interplay of anatomical, hormonal, vascular, inflammatory, and lifestyle-related factors (Gabriel et al., 2023). It may also be associated with insulin resistance, obesity, and increased cardiovascular risk Hyperinsulinemia accelerate can lipodystrophy (Tokarska et al., 2018). Although not classified as a disease, cellulite reduction is considered desirable. as most women find it hard to accept the

cellulite-induced changes in skin appearance and that it significantly impairs their quality of life (**Hexsel** et al., 2010).

Mesotherapy is known as local intradermal therapy, which is a minimally invasive method that involves the injection of therapeutic agents such as drugs and bioactive substances into the skin at a depth of 2-4 mm (Tang et al., 2022). Through intradermal injections, mesotherapy can extend the duration that therapeutic agents remain in the targeted area. This allows for the use of lower doses longer intervals and between sessions, potentially improving treatment outcomes and enhancing patient compliance (Gupta et al., 2023).

Phosphatidylcholine (PPC), a lecithin-derived phospholipid, has also been introduced to reduce the appearance of cellulite through its lipolytic effect on local subcutaneous fats. PPC shows the possibility of destroying only adipose tissue without damaging tissues. PPC other alone can promote adipose tissue-specific reduction via the Tumor necrosis factor α (TNF α) and Interleukin 1 β (IL-1 β) pathways without damage to other tissues (Jung et al., 2019).

High-frequency ultrasound is an effective tool in cellulite assessment. Both conventional devices equipped with linear transducers and those with skindedicated mechanical transducers can be used (**Mlosek et al., 2024**). It is cheaper and safer than CT and MRI, as it allows no exposure to radiation (**Störchle et al., 2018**).

Aim of the work

This study aims to assess the lipolytic effects of phosphatidylcholine mesotherapy for treating cellulite in the buttocks and upper thigh regions.

Patients and Methods

This study (Randomized controlled trial) included thirty patients suffering from obesity whose BMI was ≥ 30 (Kg/m2) and had cellulite in the buttocks or upper thigh. All Patients were recruited randomly from those attending the outpatient clinics of the Rheumatology, Rehabilitation, and Physical Medicine department at Benha University Hospitals between March 2022 and September 2022.

Patients were classified into two groups: Group 1: Including 15 patients treated by phosphatidylcholine mesotherapy (once weekly for six successive weeks), low-calorie diet, and physical training exercise program. Group (2): Including 15 patients treated by a low-calorie diet and physical training exercise program only.

Ethical considerations

All patients provided informed written consent before participating in this study, and consent for photos was also obtained. It received approval from the ethical committee of the Faculty of Medicine, Benha University (code number: MD 10-10-2021).

Exclusion criteria

Patients were excluded from this study if they had any systemic diseases, such as heart disease, kidney disease. uncontrolled diabetes. hypothyroidism, infections, active or previous autoimmune diseases, or active skin disorders. Patients who were taking aspirin, other antiinflammatory drugs, steroids, oral contraceptives, or those with a known bleeding tendency were excluded. Patients with a soy allergy were also excluded, as the usual PC/DC mixture is soy-based. Individuals under 16 years of age, pregnant or lactating women, and patients with morbid obesity (BMI $> 40 \text{ kg/m}^2$) were not included in the study.

All participants of this study were subjected to the following

Full history taking: With special focus on sex, age, dietary history, smoking. diabetes Mellitus. hypertension, drugs as corticosteroids. antidepressants. causes of obesity (e.g., increased food intake, decreased physical activity. drugs, pregnancy, endocrine disorders, etc.).

General Examination:

General appearance and body build, Height, Weight, Vital signs: (Pulse, Temperature, Blood pressure, and Respiratory rate).

Laboratory investigations: Fasting blood sugar, Complete blood count (CBC), Lipid profile. Liver function tests: Serum glutamic oxaloacetic transaminase (SGPT), glutamate Serum pyruvate transaminase (SGOT), Serum Thyroid Functions: creatinine. Thyroid-Stimulating Hormone (TSH), triiodothyronine(T3), and Thyroxine (T4).

Assessment of obesity was done at the start of the study, before every

weekly session for six successive weeks, and at the end of the study in the form of anthropometric parameters (weight, height, Body mass index (BMI), Waist circumference (WC), Hip circumference (HC) and Waist hip ratio (WHR).

Weight and height were measured according to the method described by **Lacey et al. (2003).** The ideal weight for females was estimated using the equation: Ideal weight = height - 105. Body Mass Index (BMI) was calculated by dividing the weight in kilograms by the square of the height in meters, following the guidelines provided by **WHO (2018).**

The circumference measurements were taken using a tape at fixed points with the patient standing. Waist circumference was measured at the level midway between the lower rib margin and the iliac crest using a tape, as per WHO guidelines (2008). Hip circumference was measured at the widest point between the hip and buttock, specifically at the point of maximum contour, also following WHO guidelines (2008). The waist-to-hip ratio then was calculated, which is used to define central obesity, as described by Yusuf et al. (2004).

Assessment of Cellulite

Assessment of cellulite stage: Stages from grade 0 to 3 according to Nürnberger and Müller (1978) Stage 0: The skin on the thighs and buttocks is smooth, whether the patient is standing or lying down. The pinch test results in folds and furrows in the skin.

- Stage I (or one plus): The skin surface remains smooth while the patient is standing or lying down. However, the pinch test is positive, showing the mattress phenomenon.
- Stage II (or two plus): The skin surface is smooth while lying down, but the mattress phenomenon is observed when the patient is standing.
- Stage III (or plus three): The mattress phenomenon is present in both lying and standing positions.

U/S evaluation of fat thickness: Measurement were recorded at right and left side of buttocks (upper lateral quadrant) and upper thigh at two points measurement: point (1) at the level of greater trochanter of the femur and point (2) at 15 cm below point (1) in the same line. *Digital photographs* were taken before and after treatments.

Technique of Mesotherapy injection:

The area to be treated was first exposed and marked while the patient was standing. Then, the patient was instructed to lie supine in a comfortable position. Physical modalities were applied to the buttocks, starting with infrared treatment before the injection. The treatment area was thoroughly sterilized using iodine or alcohol. It was important to insert the needle rapidly but gently, ensuring that the syringe was emptied slowly. The marked area was injected with multiple injections, each containing 2 ml of the drug solution, spaced 2 cm apart and administered at a 45-degree angle to the skin using the "Point by Technique." After Point the injections, a 5-minute massage was performed using the Relax & Spin Tone Device.

Sample size calculation

Sample size was calculated by Stata Corp., 2021. Stata Statistical Software: Release 17. College Station, TX: Stata Corp LLC. Median percentage of WC reduction was 9.575% as reported by Abdel Haleem et al., 2022. The null hypothesis was considered at 1%, using an α error of 5% and a power of 80%. The required minimal sample size is 28 subjects. The sample size was increased to 30 subjects, they were divided equally into two groups (15 subjects per group).

Statistical analysis:

The collected data were revised, coded, and tabulated using the Statistical Package for Social Science (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. Data were presented, and suitable analysis was done according to the type of data obtained for each parameter.

statistics Descriptive were employed to summarize the data, using the mean, standard deviation $(\pm$ SD), median, and range for numerical data, and frequency and percentage for non-numerical data. To assess the normality of the data distribution, the Shapiro-Wilk test conducted. In terms of was analytical statistics, various tests were used to evaluate the statistical significance of differences between groups and periods. The Student's T-test was applied to assess the significance of differences in

parametric variables between two study groups, while the Paired Ttest was used to evaluate changes in parametric variables over time. For non-parametric variables, the Mann-Whitney Test (U test) was used to compare two study groups, and the Wilcoxon Test (Z test) was used to compare two periods. The Chi-Square test examined the relationship between two qualitative variables, while the Monte Carlo test was utilized when the expected count was less than 5 in more than 20% of the cells. The Marginal Homogeneity test was applied to determine differences in a dichotomous dependent variable between two related groups. For regression analysis, logistic regression was used to predict risk factors when the dependent variable was categorical. The odds ratio (OR)measures the association between an exposure and an outcome, where an OR of 1 suggests no effect, an OR greater than 1 indicates a higher risk, and an OR less than 1 suggests a The protective effect. 95% confidence interval (CI) provides an estimate of the precision of the OR, with a larger CI indicating lower precision. A p-value of less than 0.05 at a 95% confidence

interval was considered statistically significant.

RESULTS

This study was conducted on 30 patients suffering from obesity and had cellulite in the buttocks and upper thigh; they were subdivided into two groups: Group 1, including 15 patients treated by phosphatidylcholine mesotherapy (once weekly for six successive weeks), low-calorie diet, and physical training exercise program. Group (2): Including 15 patients treated by low low-calorie diet and a physical training exercise program only.

The mean age of Group $1(37.93 \pm 6.58 \text{ years})$, with comparable to Group 2 (34.13 \pm 8.35 years, p=0.177). The range of ages in both groups spans from 20.0 to 48.0 years.

Regarding Anthropometric data as shown in Table 1, there were statistically significant differences regarding the percentage of reduction of weight and BMI before and after treatment in both groups (p < 0.001 for each group). Before the study, there was no significant difference in WC between the two groups (p = 0.101). However, by the end of the study, Group 1 showed a significant

reduction in WC (mean ± SD: 98.70 ± 8.76 cm) compared to Group 2 (mean \pm SD: 110.93 \pm 9.66 cm (p=0.001). Similar results were observed for hip circumference, with Group 1 showing a significant reduction at the end of the study (mean \pm SD: 115.7 ± 5.73 cm) compared to Group 2 (mean \pm SD: 123.2 \pm 5.99 cm) (p = 0.002). Additionally, the waist-to-hip ratio significantly decreased at the end of the study in both groups, and the reduction was more prominent in Group 1 (mean \pm SD: 0.84 \pm 0.05) compared to Group 2 (mean \pm SD: 0.90 \pm 0.04) (p =0.001). Both groups had similar distributions of cellulite grades before the study, with no significant difference between them (p=0.563). At the end of the study, Group 1 showed а significant reduction in cellulite staging compared to Group 2 (p=0.006). The statistical test indicated significant а improvement in cellulite grades by the end of the study when compared to baseline staging for both groups (p<0.001 for Group 1 and p=0.046 for Group 2), as shown in Table 2, Fig. 1.

This table shows a significant reduction in cellulite staging in Group 1 compared to Group 2 Digital photography also reduction in cellulite grade before and after PPC mesotherapy (lateral view), Fig. 2. According to fat thickness measurement at buttock by MSUS after intervention, Group 1 showed significant decrease in fat а thickness measurement at buttock by MSUS on both the right side $(\text{mean} \pm \text{SD}: 3.66 \pm 0.85 \text{ cm})$ and the left side (mean \pm SD: 3.43 \pm 0.81 cm) compared to Group 2 (right side: mean \pm SD: 4.39 \pm 0.59 cm, left side: mean \pm SD: 4.27 \pm 0.69 cm) (p2<0.001* for both sides). We also measured MSUS fat thickness at the upper thigh (right and left sides) at two points (point 1 at the level of the greater trochanter and point 2 at 15 cm below the greater trochanter in the thickness same line). fat measurement at right upper thigh in Group 1 and Group 2 reveals interesting findings, at the end of the study, Group 1 exhibited a significant decrease in fat thickness MSUS measurement at upper thigh $(\text{mean} \pm \text{SD}: 3.18 \pm 0.49 \text{ cm})$ compared to Group 2 (mean \pm SD: 3.59 ± 0.58 cm) (p = 0.044). Similar results were observed at point 2, with Group 1 showing a significant reduction in **MSUS** thigh measurement on the right side $(\text{mean} \pm \text{SD}: 2.86 \pm 0.54 \text{ cm})$

compared to Group 2 (mean \pm SD: 3.40 ± 0.57 cm) by the end of the study (p = 0.012). Similar results were observed at upper thigh on the left side, , Group 1 exhibited a significant reduction in MSUS fat thickness measurement at upper thigh on the left side by the end of the study (mean \pm SD: 2.79 \pm 0.66 cm) compared to Group 2 (mean \pm SD: 3.30 ± 0.59 cm) (p =0.033) in comparison with non-significant difference between two groups before the study (p =0.356). Similar results were observed at point 2, with Group 1 showing a significant reduction in MSUS thickness measurement at upper thigh on the left side (mean \pm SD: 2.79 ± 0.61 cm) compared to Group 2 (mean \pm SD: 3.21 \pm 0.48 cm) at the end of the study (p=0.046). fig3,4.

In **fig5** we measured fat thickness in a patient by MSUS at at upper part of right thigh at the level of greater trochanter (point 1) before and after ppc injection, found improvement of fat thickness measurement form 3.84 cm before ppc injection as shown in photo (A) to 2.81 cm after ppc injection as shown in photo (B).

According to laboratory findings, there were no significant differences in CBC parameters,

ALT, serum creatinine, TSH, T3, and T4 levels between Group 1 and Group 2. The significant improvement was shown in lipid profile in both groups by the end of the study, $P = 0.001^*$ for both groups. Before the study, group 1 showed FBS Mean \pm SD (96.07 \pm 8.52) and (96.53 ± 9.23) in group 2, while after the study, FBS Mean \pm SD was (87.27 ± 9.51) and (83.60) \pm 7.07) for group 1 and 2, respectively. There was a significant reduction in FBS at the end of the study. $P < 0.001^*$ for both groups.

PPC resulted in no considerable side effects except for mild pain and local erythema as which improved shortly after treatment sessions with no residuals.

DISCUSSION

Cellulite is a morphological and aesthetic alteration of the skin and the subcutaneous adipose tissue, which occurs mainly in the abdomen, thighs, and buttocks, associated with the appearance of wavy skin (Kardashova et al., **2024**). Mesotherapy involves the subcutaneous injection of compounds to induce lipolysis and appearance improve the of cellulite, Phosphatidylcholine is the one most consistently used (Dhillon et al., 2023).

In the present study, we assessed cellulite grade and fat thickness measurements by ultrasound before and after PPC injection.

Results found that there was no statistically significant difference in weight and BMI in both groups before and after treatment. However, both groups showed a significant reduction in weight and BMI by the end of the study. In harmony with our study, Pranoto et al., (2024) systematic review provides current evidence supporting combining exercise interventions with dietary restrictions in the management of obese individuals. In addition, Taati and Khoshnoodnasab, (2019) found that exercise training can improve lipolysis and body composition and decrease the severity of cellulite through increased blood flow to adipose tissue. It seems that the combination of regular physical (Taati activity and Khoshnoodnasab, 2019). On the other hand, Gaesser et al., (2011) stated that physical activity and structured exercise programs rarely result in significant loss of body weight or body fat.

In the present study, Group 1 showed a significant reduction in (WC, HC, and WHR) compared to (p2=0.001). Group 2 One longitudinal study, conducted on obese women who received an individualized low-calorie diet (LCD) and were followed up for five months. revealed that following HC, WC, and WHR values consistently decreased, and BMI showed a significant and consistent decline (Ebrahimzadeh et al., 2024). On the other hand, in Mohamed et al., (2015) study which conducted on a group received treatment in the form of mesotherapy injection and diet showed that there was no significant reduction of hip circumference after mesotherapy injection and diet with significant decrease in body weight, BMI, waist circumference and W/H ratio(p<0.01) for each. The difference between the present results and the results of Mohamed et al., (2015) regarding hip circumference might be due to the different site of injection between the two studies, as they used mesotherapy injection for abdominal obesity, while in our study as we used it for cellulite in the buttocks and upper thigh.

In the current study, there was a significant improvement in cellulite grades by the end of the study when compared to baseline staging for both groups, with a significant reduction in cellulite staging in Group 1 compared to Group 2. Results of Sylwia& Krzysztof (2017) were in the same line with our results, they found that intradermal mesotherapy reduced the severity of cellulite. Cellulite reduction confirmed by Nürnberger-Müller's grade (Nürnberger and Müller, 1978), palpation, and decreased thigh circumference. Park et al., (2008) disagreed with our study and found that Mesotherapy is not an alternative effective treatment modality for body contouring.

We prove the efficacy of mesotherapy in cellulite reduction only by anthropometric not measurements but also by measuring subcutaneous fat thickness using musculoskeletal ultrasound (MSUS). Our study showed a significant decrease in fat thickness measurement at the buttock and upper thigh by MSUS on both the right side and the left side in Group 1 compared to Group 2 ($p2 < 0.001^*$ for both sides), with positive changes in body fat reshaping. Corresponding to our results, a study of Abdel Haleem et al., (2022) was conducted on thirty female patients with obesity, classified into three groups: group injected I was with phosphatidylcholine/ deoxycholic acid PPC/DCA, group II with caffeine, and group III with a cocktail. They showed that there were statistically significant differences regarding the percentage of reduction of (Supra and Infra umbilical) fat thickness measurements by US pre and post intervention in all groups, being highest in group III, followed by group I, then group II.

Regarding lipid profile before and at the end of the current work_for each group, both groups showed significant improvement in lipid profile by the end of the study. Changes in the lipid profile levels may be related to diet and exercise regimens used in both groups, which improved and increased body metabolism. **Khalafi et al.**, (**2023**) systematic review and meta-analysis match our opinion.

The current study showed that PPC resulted in no considerable side effects except for mild pain and local erythema, which improved shortly after treatment sessions with no residuals.

CONCLUSION

Phosphatidylcholine mesotherapy offers a good, non-surgical option for cellulite reduction. PPC leads multidimensional to improvement with a reduction of anthropometric parameters and cellulite grade. PPC mesotherapy had a greater impact on reducing MSUS fat thickness measurements, with positive changes in body fat reshaping. However, further research is needed to establish standardized protocols and to better understand long-term outcomes.

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	1	Group 1	Group 2	Test	P1
		n = 15	n = 15		
ght	Height (cm)				
	Mean ± SD.	161.0 ± 4.22	163.3 ± 5.63	t ₁ =	0.203
	Median	162.0	163.0	1.303	
Hei	Min. – Max.	155.0 - 170.0	148.5 - 173.0		
	Before study				
	Mean ± SD.	88.57 ± 12.02	92.15 ± 12.35	t ₁ = 0.806	0.427
	Median	90.0	90.50		
	Min. – Max.	66.0 - 112.0	76.50 - 118.0		
	At the end of study				
	Mean ± SD.	82.67 ± 12.45	87.43 ± 12.47	t1=	0.304
(jg	Median	83.0 85.0		1.048	
t (k	Min. – Max.	59.0 - 105.0	70.50 - 110.0		
igh	Test	t ₂ =13.177*	t ₂ =8.454*		
Wei	p2	p2<0.001*	p2<0.001*		
	Before study				
	Mean ± SD.	34.11 ± 4.02 34.47 ± 3.64		$t_1 =$	0.799
	Median	34.60	34.60	0.257	
	Min. – Max.	25.10 - 39.60	28.80 - 40.0		
	At the end of study				
	Mean \pm SD.	$32.10 \pm 3.85 \qquad \qquad 32.71 \pm 3.87$		$t_1 =$	0.671
cm ²	Median	32.0	33.30	0.429	
kg/c	Min. – Max.	24.90 - 38.40	26.10 - 39.20		
II ()	Test	t ₂ =9.380*	t ₂ =9.044*		
BN	p2	p2<0.001*	p2<0.001*		
	Before study				
	Mean \pm SD.	109.1 ± 8.79	114.6 ± 9.06	$t_1 =$	0.101
WC (cm)	Median	110.0	115.0	1.698	
	Min. – Max.	95.0 - 122.0	99.0 - 127.0		
	At the end of study				
	Mean \pm SD.	98.70 ± 8.76	110.93 ± 9.66	$t_1 =$	0.001*
	Median	100.0	112.50	3.633*	
	Min. – Max.	80.0 - 113.0	91.0 - 125.50		
	Test	t ₂ =9.170*	t ₂ =3.992*		
	p2	p2<0.001*	p2=0.001*		

Table	1:	Comparison	between	the	studied	groups	regarding
anthropometric measurements before and after treatment.							

Con. Table 1

	Before study				
(Mean \pm SD.	122.3 ± 6.06	124.9 ± 5.81	$t_1 =$	0.234
	Median	123.0	124.5	1.215	
	Min. – Max.	111.0 - 132.0	117.0 - 134.5		
(cm	At the end of study				
HC	Mean \pm SD.	115.7 ± 5.73	123.2 ± 5.99	$t_1 =$	0.002*
	Median	115.5	123.0	3.488*	
	Min. – Max.	104.0 - 125.0	114.0 - 133.5		
	Test	t ₂ =8.80* t ₂ =5.363*			
	p2	p2<0.001* p2<0.001*			
	Before study				
	Mean \pm SD.	0.89 ± 0.06	0.92 ± 0.04	$t_1 =$	0.224
WHR	Median	0.89	0.92	1.243	
	Min. – Max.	0.80 - 1.01	0.85 - 0.98		
	At the end of study				
	Mean \pm SD.	0.84 ± 0.05	0.90 ± 0.04	$t_1 =$	0.001*
	Median	0.83	0.90	3.553*	
	Min. – Max.	0.76 - 0.94	0.81 - 0.97		
	Test	t ₂ =5.085*	t ₂ =4.159*		
	p2	p2<0.001*	p2=0.001*		

WC: Waist circumference. HC: Hip circumference. WHR: Waist/Hip ratio.

SD.: Standard deviation, Min.: Minimum, Max.: Maximum, t₁: Student t test. t₂: Paired t-test.

p1: Comparing the two studied groups, p2: Comparing before and after intervention,

*: Significant when p value <0.05.

Grading of cellulite	Group 1 n = 15		Group 2 n = 15		Test	p1
	No.	%	No.	%		
Before study						
Stage I	2	13.3	1	6.7	$\chi^2 =$	MC
Stage II	6	40.0	4	26.7	1.341	0.563
Stage III	7	46.7	10	66.7		
At the end of the study						
Stage 0	2	13.3	0	0.0	$\chi^2 =$	MC
Stage I	5	33.3	3	20.0	11.969*	0.006*
Stage II	8	53.3	4	26.7		
Stage III	0	0.0	8	53.3		
Test	MH=26.0*		MH=8.0*			
p2	p2 p2<0.001*		p2=0.046*			

Table 2: Comparison between the two studied groups regarding grading of cellulite.

 χ^2 : Chi Square test. MC: Monte Carlo test, MH: Marginal Homogeneity test, p1: Comparing the two studied groups, p2: Comparing before and after intervention, *: Significant when p value <0.05. This table shows a significant reduction in cellulite staging in Group 1 compared to Group 2



Fig. 1: Column chart for comparison between the two studied groups regarding reduction in cellulite grades



Figure 2: Comparison of cellulite grade before and after ppc mesotherapy (lateral view).



Fig 3: Column chart for comparison between the two studied groups regarding MSUS fat thickness measurement at buttocks (right and left side) at the end of the study.

Multidimensional Evaluation of Phosphatidylcholine Mesotherapy in Cellulite Management Hend AF Abd Elaziz; Refaat M Eltanawy; Nashwa I Hashad and Arwa S Amer



Fig 4: Line chart for comparison between before and at the end of the study regarding MSUS fat thickness measurement at the upper thigh on the right side at point 1 and point 2.



Fig. 5: MSUS fat thickness measurement at the upper part of the left thigh at the level of the greater trochanter (point 1) before ppc injection (photo A) and after ppc injection (photo B).

Multidimensional Evaluation of Phosphatidylcholine Mesotherapy in Cellulite Management Hend AF Abd Elaziz; Refaat M Eltanawy; Nashwa I Hashad and Arwa S Amer

تقييم متعدد الابعاد للفوسفاتيديل كولين ميزوثيرابي في علاج السيليو ليت

هند أحمد فتحي عبد العزيز ، رفعت مصطفى الطناوي،نشوي اسماعيل حشاد و أروي السيد عبد الرحمن

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الملخص العربي:

السيلوليت هو اضطراب شائع يؤثر على الأنسجة تحت الجلد ويغير من مظهر سطح الجلد، أكثر المناطق تأثراً هي الفخذين، الوركين، والمؤخرة. يتم تطبيق علاج الفوسفاتيديل كولين (PPC) عن طريق الحقن تحت الجلد داخل الأدمة لتقليل مظهر السيلوليت من خلال تأثيره على الدهون تحت الجلد. تهدف هذه الدراسة لتقييم التأثير التحللي للدهون لعلاج السيلوليت في منطقتي المؤخرة والفخذ العلوي باستخدام العلاج بالـ. PPC. تم تقسيم المشاركين إلى مجموعتين: المجموعة الأولى اتبعت العلوي باستخدام العلاج بالـ. تهدف هذه الدراسة لتقييم التأثير التحللي للدهون لعلاج السيلوليت في منطقتي المؤخرة والفخذ العلوي باستخدام العلاج بالـ. PPC. تم تقسيم المشاركين إلى مجموعتين: المجموعة الأولى اتبعت العلوي باستخدام العلاج بالـ. PPC. تم تقسيم المشاركين إلى مجموعتين: المجموعة الأولى اتبعت انظامًا غذائيًا منخفض السعرات متارين رياضية، وتلقيت حقن PPC أسبوعيًا لمدة 6 أسابيع، بينما المحموعة الأولى اتبعت المجموعيتين فن فعل وبعد الدراسة من رياضية وتلقيت حقن PPC أسبوعيًا لمدة 6 أسابيع، بينما المحموعة الأولى وبعد الدراسة من حيث المعايير الجسمانية مثل الوزن، مؤشر كثلة الجسم، محيط المجموعتين قبل وبعد الدراسة من حيث المعايير الجسمانية مثل الوزن، مؤشر كثلة الجسم، محيط المحموعتين قبل وبعد الدراسة من حيث المعايير الحسمانية مثل الوزن، مؤشر كثلة الجسم، محيط المجموعتين قبل وبعد الدراسة من حيث المعايير الجسمانية مثل الوزن، مؤشر كثلة الجسم، محيط المحمو والورك، ودرجة السيلوليت، بالإضافة إلى الفحوصات المخبرية وقياسات سمك الدهون المحمو وسكر الدم في كلا المجموعتين(0.00 > q) ، مع تحسن أكبر في المجموعة الأولى. كما باستخدام الموجات فوق الصوتية . أظهرت النائج انخفاضًا كبيرًا في الموايير الجسمانية والملف الحموي والمؤلى المحموعة الأولى والمولي كما بالتحمي وسكر الدم في كلا المجموعتين(1000 > q) ، مع تحسن أكبر في المجموعة الأولى. كما وبود تحسن ملحوظ في درجات السيلوليت وسمك الدهون في الفخذين والمؤخرة في المجموعة الأولى الوحمي مقار نا بالمجموعة الأالية السيلوليت وعلام كارباح في معالم الجسم ، تقليل سمك الدهون، وتحسين ملحر المون وي المحموي مالولي ما عير ما ملول والمو مواين أولى الموموع المولي والموذمو في الفخذين والمؤذة في المجموع الأولى الوحظ تحسين ملحور في ملور مل عالم ما عرما ما مالم ما مر مالول ما ما ير ما

الكلمات المفتاحية: سيليوليت ميز وثير ابي, الفوسفاتيديل كولين, (PPC), الحقن التحللي للدهون.