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COMPARISON OF THE EFFECTIVENESS OF HARDWARE METHODS IN COMBATING CELLULITE, IMPROVING SKIN TONE AND BODY CONTOURS

Summary. *This article reviews various hardware methods used to treat cellulite, improve skin tone and model body contours. The main goal of the work was to show how these approaches differ from each other and what clinical results can be expected when using them, based on the analysis of already published studies. Standard scientific approaches were used in the work - analysis and generalization of data, comparison of results and systematization of information from various sources. The results obtained indicate that hardware methods for correcting cellulite differ significantly both in terms of mechanisms of action and in the severity and duration of the effect. Radiofrequency therapy mainly affects the dermis, promoting collagen remodeling and increasing skin elasticity, but its ability to eliminate cellulite depressions is usually limited. Extracorporeal shock wave therapy demonstrates a noticeable reduction in the severity of cellulite, which is associated with improved microcirculation and activation of regenerative processes in tissues, although the optimal regimens for its use remain the subject of further research. Mechanical vacuum-assisted therapy provides rapid visual improvement by reducing swelling and congestion, but this effect is usually temporary and requires regular repetition of procedures. Laser techniques, in turn, have proven to be a heterogeneous group: low-intensity*

laser therapy gives conflicting results, while laser-assisted subcision demonstrates a more stable improvement in skin structure and a reduction in cellulite, especially in the thighs and buttocks. Vibration exercises mainly affect muscle activity and body composition, so it is advisable to consider them as an auxiliary element in complex programs, and not as an independent method of cellulite correction. Subcision, although it is the most invasive approach, shows the most pronounced effect in cases of deep cellulite indentations, since it directly eliminates the mechanical factors of their formation. The practical significance of the analysis is that it allows a more reasoned approach to the choice of hardware techniques, adapting the treatment tactics to the type of cellulite, skin condition and expected clinical result, which is key for individualized correction.

Key words: *cellulite, hardware therapy, skin, body contours, subcision*

Introduction. Today, cellulite is considered a common condition observed in women of different racial and ethnic groups. At the same time, a clearly defined age of its occurrence has not been determined, in general, this age is after the onset of puberty. According to clinical observations, this condition becomes most noticeable and pronounced in women, in the age range of 20–30 years. In men, similar changes occur much less frequently and, as a rule, are associated with the presence of androgen deficiency. Thus, about 2% of men may have manifestations of cellulite on the background of hypogonadism or in conditions of estrogen and antiandrogen therapy. Epidemiological data on the prevalence of cellulite and factors contributing to its formation remain limited. This is due to the lack of systematic population-based medical and social studies. At the same time, an analysis of available literary sources [3,4,7] indicates that cellulite is detected in approximately 80–90% of women. This problem is especially relevant for countries with a high proportion of the population with excess body weight, where aesthetic and metabolic factors are closely combined. In the United States of America, in particular, there is a consistently high demand for the correction

of this condition. Thus, according to professional statistics, in just one year, surgeons associated with the American Society of Aesthetic Plastic Surgeons performed more than 86,000 minimally invasive cellulite treatment procedures using various hardware techniques. Such a number of interventions clearly emphasizes the clinical and social significance of the problem and its place in the modern system of aesthetic medicine [4].

Literature Review. The issue of comparing the effectiveness of hardware techniques in combating cellulite, improving skin tone and body contours is sufficiently studied in the world scientific literature, which presents both review works that highlight general approaches and studies devoted to individual technologies. Generalized reviews provide a broad context of the problem, such as publications by Luebberding S., Krueger N., Sadick N.S. [7], Gabriel A. et al. [4], as well as Friedmann D.P., Vick G.L., Mishra V. [3], Piłat P. et al. [8], which consider the mechanisms of cellulite, methods for assessing its severity and compare different approaches to treatment, including hardware ones.

Particular attention is paid to the issue of objectification of results in the work of Young V.L., DiBernardo B.E. [10], which compares cellulite severity scales and imaging methods, which is key to conducting sound comparative studies. In terms of individual techniques, ultrasound technologies are discussed in the studies of Bani D. et al. [1], which examined histological and ultrastructural changes in adipose tissue due to cavitation, and Sohn Y.J., Chun H. [9], which evaluated the effectiveness of ultrasound and high-frequency equipment for abdominal fat reduction. The HIFU technique is systematized in the review of Haykal D. et al. [5]. Radiofrequency technologies are studied in the work of Duncan D.I. et al. [2], Hugul H., Oba M.Ç., Kutlubay Z. [6].

Despite the sufficient amount of literature on this topic, there is a lack of systematic material for a full comparison of hardware methods, and therefore, using various methods of scientific knowledge, the information was analyzed, grouped, systematized and presented in the light of the research topic.

The Purpose of the Article. The purpose of the article is to show the differences in the use of hardware methods against cellulite based on a review of clinical research results.

Author Contributions. The author's contribution to this work is a systematic comparative analysis of hardware methods for cellulite correction from the standpoint of their morphological targets, clinical effectiveness and stability of results over time. Unlike most review publications, the article not only describes individual technologies, but also compares them according to the leading pathogenetic components of cellulite - dermal, microcirculatory-lymphatic, adipose and septal. The proposed approach allows us to interpret clinical results not as an isolated effect of a specific device, but as a consequence of a directed effect on the structural levels of the dermal-subcutaneous complex, which is of fundamental importance for the individualization of therapeutic strategies in the practice of aesthetic medicine.

Research Results. Cellulite is currently considered a dermatological condition that manifests itself in characteristic local changes in the skin. Most often, these changes occur in areas with a more pronounced accumulation of adipose tissue: thighs, buttocks and in the femoral-hip area. From a clinical point of view, cellulite is manifested by unevenness of the skin surface in the form of dimpling, depressions or nodular formations that form a typical relief, which at the everyday level people describe as an "orange peel" or "cheese" surface.

In specialized medical literature, a number of terms are used to designate this condition, including "gynoid lipodystrophy", "nodular liposclerosis" and others. Such terminological variability reflects different approaches to understanding the mechanisms of cellulite development and the features of its pathophysiology [4]. In clinical conditions, three levels of cellulite are distinguished (Table 1).

Table 1

Cellulite levels and skin condition characteristics

Cellulite grade (according to Nürnberger–Müller)	Skin condition description
0	Skin appears smooth both when standing and lying down; no signs of cellulite are present.
I	Skin looks smooth at rest (both standing and lying), but dimpling and a "mattress-like" texture appear during the pinch test.
II	Skin seems smooth at rest, but when standing, uneven texture, dimples, and a "mattress-like" appearance become visible.
III	Dimpling, uneven texture, and a "mattress-like" appearance are clearly visible both when standing and lying down.

Note: based on [10]

Despite the fact that cellulite is not accompanied by pain in most cases, its clinical significance is determined primarily by aesthetic standards. These standards lead to a number of psychosocial consequences that are often recorded in women with cellulite. These include: dissatisfaction with one's own body, emotional and psychosocial distress, increased anxiety and decreased quality of life; decreased motivation, etc. All these feelings become the reason for seeking treatment for cellulite [4].

At the same time, despite its exclusively external manifestations, cellulite remains a complex problem from a therapeutic point of view. This is due, on the one hand, to an incomplete understanding of its origin and mechanisms of development (etiopathogenesis), and on the other hand, to the limited and often unstable effectiveness of most existing correction methods. Anatomical data presented in modern reviews allow us to consider cellulite as a kind of "architectural", basic disorder of the dermis and the associated subcutaneous fat, which explains the persistence of skin relief changes, as well as significant variability in the response to therapeutic interventions [4]. In practice, the clinical arsenal of cellulite treatment methods is quite wide and covers approaches from non-invasive to minimally invasive. Thus, a systematic review of 67 scientific

papers [7] showed that a significant part of the studies, including works on laser and light techniques, radiofrequency technologies and other approaches, had significant methodological shortcomings. In particular, a number of studies showed the effect before and after, without taking into account the severity of cellulite, which accordingly affected the statistical argumentation of the results. In addition, 19 of the 67 studies had a placebo-controlled randomized design [7], based on a survey of "whether the client is satisfied with the result".

Against this background, the review authors noted the presence of certain data on the potential effectiveness of only individual methods. The effectiveness of acoustic wave therapy and minimally invasive laser is most clearly observed. Although it cannot be said that other methods are ineffective.

Hardware methods for cellulite correction do not constitute a homogeneous group and differ both in their mechanisms of action and clinical goals. Some of them are aimed primarily at remodeling the dermis by inducing collagen changes, others at modifying the superficial fat layer, in particular through a selective effect on adipocytes. Some technologies are focused on reducing the edematous components by improving microcirculation and lymphatic drainage, while more invasive approaches involve directly eliminating the mechanical "anchoring" of the dermis by fibrous septa through subcision [3].

Hardware techniques include: radiofrequency therapy, extracorporeal shock wave therapy, mechanical vacuum-assisted therapy, laser methods (including low-intensity laser therapy and laser-assisted subcision), vibration exercises, as well as various subcision options, in particular manual and vacuum-assisted [3]. Let us consider them in more detail.

Radiofrequency therapy (RF) is widely used for cellulite correction. It is based on the conversion of electrical energy into thermal energy due to the electrical resistance of tissues, or the so-called bioimpedance. This allows for controlled heating of the dermis and superficial layers of subcutaneous fat without damaging the epidermis [4]. Depending on the configuration of the electrodes

(mono-, uni-, bi- or multipolar), the electrothermal effect leads to the reduction and remodeling of collagen fibers, stimulates neocollagenesis processes and, ultimately, contributes to the improvement of the elasticity and elastic properties of the skin in the affected areas [6].

Clinically, this is usually manifested by moderate skin tightening, a decrease in the severity of dimpling and waviness of its surface, as well as subjective improvement of contours, most often in the area of the thighs and buttocks [3]. Quite often, deep tissue heating can be accompanied by damage to adipose tissue cells. When conducting a course of several procedures, such changes are accompanied by a decrease in the thickness of subcutaneous fat and the circumference of individual anatomical areas (most often the abdomen and thighs). At the same time, the improvement in the appearance of cellulite in such cases is usually moderate [4].

Given the predominantly superficial effect of individual RF modes, radiofrequency therapy is often combined with mechanical massage and infrared energy in order to enhance the effect on microcirculation and the dermal matrix [3]. Standardized protocols for the use of this technique have not been developed.

Extracorporeal shock wave therapy (ESWT, pulse activation therapy) is based on the local transmission of shock waves into the tissue. These waves are generated outside the body and are directed directly into the dermal-subcutaneous layer, where their biological effect is realized [9]. Clinical protocols used for cellulite correction usually use defocused low-energy shock waves, which do not have a destructive effect on the tissues, but act mainly through mechanotransduction mechanisms. The biological effect of ESWT is associated primarily with the improvement of microcirculation and lymphatic drainage, stimulation of neovascularization processes, as well as remodeling of the collagen skeleton [5].

At the clinical level, a number of studies have described a decrease in the severity of cellulite according to standardized assessment scales after a course of

several sessions. Most often, these are protocols that include 6–8 procedures with weekly intervals, after which the skin microrelief is smoothed and the characteristic "orange peel" effect is reduced [3]. Body weight does not decrease, but limb circumference or local volume indicators change. The optimal parameters of therapy (energy level, number of pulses within one session and intervals between procedures) still do not have a single standardization and require further clarification within the framework of controlled clinical studies [4].

Mechanical vacuum-assisted therapy (vacuum or apparatus lymphatic drainage) belongs to a group of apparatus techniques, within which controlled cycles of positive and negative pressure are created using special attachments. As a result of such an effect, rhythmic stretching and a kind of "pumping" of the skin and the surface layer of subcutaneous fat in areas with cellulite manifestations occur. The mechanical effect of vacuum is associated with increased venous outflow and lymphatic drainage, redistribution of extracellular fluid and reduction of stagnant phenomena in the dermal-subcutaneous layer. In such technologies, the skin is fixed with a vacuum chamber, which allows you to accurately set both the depth of dissection of fibrous septa (usually 6 or 10 mm) and the treatment area (approximately 5 cm or 3×6 cm) using a microblade. Standardization of the depth and direction of septum intersection minimizes the risk of excessive skin lifting and provides a more reproducible and predictable clinical outcome.

Clinically, this is reflected in an improvement in the appearance of the treated areas: the skin looks less swollen, the microrelief becomes more even, and the contours are more defined. At the same time, it is important to emphasize that such an effect is mainly temporary and requires repeated courses of procedures. This is due to the fact that with vacuum-assisted massage, the structural reorganization of fibrous septa is minimal, and therefore the stability of the correction of cellulite depressions remains limited [3].

Special attention needs to be paid to the clear distinction between vacuum-assisted massage and cryolipolysis, which are sometimes mistakenly perceived as similar techniques. In the case of cryolipolysis, a vacuum applicator is used to capture the fat fold between the cooling panels, while the key therapeutic effect is associated with the controlled damage of adipocytes under the influence of low temperature. Further reduction of the fat layer thickness and circumference in the areas of local deposits occurs gradually, over weeks or months, and is not directly related to the drainage "vacuum" effect as such [4].

In clinical practice, within the framework of the study [4], an analysis of 13 cellulite cases was conducted. According to the results of the use of vacuum therapy, a statistically significant decrease in the modified CSS score by approximately 2 points out of 6 was observed already 3 months after the intervention, with the achieved effect being maintained after one year. More than 90% of patients had at least one level less cellulite severity, 94% were satisfied with the result, and on the GAIS scales, a noticeable or pronounced improvement was recorded in 98–100% of cases. Visually, this was manifested by the formation of a smoother contour of the buttocks and thighs, the alignment of dimples while preserving natural anatomical bulges [4].

Laser approaches used for cellulite correction include both non-invasive low-level laser therapy (LLLT) and minimally invasive laser-assisted therapy. These methods fundamentally differ in both the targets of exposure and the nature of the tissue response, which leads to different clinical effects and indications for use [3]. Low-level laser therapy is usually implemented using radiation with a wavelength of mainly about 635 nm, which does not cause a thermal increase in tissue temperature [4]. In clinical practice, LLLT protocols most often involve a course of 6–8 sessions lasting up to 30 minutes each. In some cases, this method is combined with additional effects that are positioned as supporting microcirculation and lymphatic drainage. Some studies report a reduction in circumference in various anatomical areas, in particular in the waist and hips. The

total number of results and reviews indicates their heterogeneity, and the clinical effect is not consistently reproducible.

Unlike low-intensity laser therapy, laser-assisted subcision is aimed directly at the key morphological components of cellulite, localized in the subcutaneous layer. As an example of such an approach, the Cellulaze system with a wavelength of 1440 nm and a side-emitting fiber optic cable, which combines mechanical intersection of fibrous septa with local delivery of laser energy, is often cited in the literature [3]. It is this combination of mechanical and energy effects that determines the difference of the method both in terms of the mechanism of action and in terms of clinical effect. In clinical observations, the effectiveness of laser-assisted subcision was quantitatively assessed on different scales, and the results obtained demonstrate a relatively high stability of the effect. In particular, 76–96% of the treated areas showed at least a one-point improvement on a five-point scale, with approximately 90% of the areas still showing improvement after 12 months. Three-dimensional analysis also reported an average reduction in dimples of almost 50% and an improvement in contours of approximately two-thirds. This is visually consistent with the ability of the method to simultaneously smooth the skin microrelief and improve its firmness in typical cellulite areas, primarily the thighs and buttocks [3].

Vibration exercises in the context of cellulite correction and body weight modification are implemented using special platforms with an oscillating surface, vibration belts or hand-held devices that generate low-frequency mechanical vibrations, usually in the range of approximately 5–45 Hz [4]. The physiological effect of such a load is explained by the induction of multiple cycles of muscle stretching and contraction with the involvement of muscle spindles and the activation of reflex contractions. As a result, local metabolism and muscle perfusion increase, which are considered as a potential mechanism of influence on fat mass and individual components of body composition. These changes may be indirectly reflected in the severity of cellulite manifestations.

In the available literature, the results of the use of vibration exercises remain heterogeneous. Some studies report a decrease in body mass index, total and trunk fat mass, skin-fat fold thickness and circumference, which was combined with an increase in muscle strength. At the same time, other studies mainly recorded an increase in strength indicators without a significant decrease in subcutaneous fat. Given this variability of effects, vibration exercises are usually interpreted not as a self-sufficient alternative to physical activity, but as an auxiliary component to standard aerobic and strength training programs. Accordingly, their contribution to the correction of cellulite is considered mainly through the support of changes in body composition and functional characteristics of muscles, rather than through a direct structural effect on the dermal-subcutaneous matrix [4]. Subcision as a hardware-surgical method of cellulite correction, unlike most non-invasive approaches, is aimed at directly eliminating the leading morphological factor in the formation of characteristic "pits". These are vertically oriented fibrous septa that fix the dermis to the deeper layers and create local indentations of the skin surface [8]. During manual subcision, a needle or cannula is inserted into the subcutaneous fat in a plane parallel to the skin surface, after which a series of controlled cutting movements sequentially cross the fibrous strands. Such mechanical release of the dermis from the septal anchors changes the distribution of stress in the dermal-subcutaneous complex and creates conditions for reformatting the location of the fat lobules. Clinically, this is manifested by a decrease in the depth and number of cellulite depressions and a smoother skin contour [3].

Let us conduct a comparative analysis of the effectiveness of hardware techniques in the fight against cellulite in Table 2.

Table 2

The effectiveness of various hardware techniques in the fight against cellulite

Hardware-based technique	Final clinical target	Effectiveness against cellulite (specific outcomes)
Extracorporeal shock wave therapy (ESWT; shock wave / pulse activation therapy)	Dermal-subcutaneous matrix (microcirculation, lymphatic drainage, collagen)	Reduction in cellulite grade on scales after 6–8 weekly sessions; smoother skin texture and less "orange peel" appearance without significant body weight changes [3]; in multi-session courses, improvements in skin appearance and reduced subjective heaviness were reported, although changes in limb circumference were not always significant [4]. Duration of effect for ESWT not specified
Radiofrequency therapy (RF)	Dermis and superficial fat (thermal stimulation of collagen, partially adipocytes)	Moderate improvement in cellulite appearance; multi-session courses led to reduced subcutaneous fat thickness and circumference, most notably in the abdomen and thighs [4]. In cellulite-prone areas: skin tightening and reduced waviness and dimpling [3]. Long-term cellulite control after RF: limited high-quality evidence available [4]
Vacuum-assisted massage / lymphatic drainage	Extracellular fluid, venous and lymphatic outflow	Visual reduction in swelling, temporary smoothing of skin texture, and more defined contours due to drainage effect [3]. Effects are mostly temporary and require repeat courses [3]
Manual subcision (needle/cannula)	Fibrous septa causing dimples	In clinical series: sustained reduction in the depth and number of dimples, significant improvement in CSS scores, high patient satisfaction. Results maintained for up to 2 years or longer [3]
Vacuum-assisted subcision (Cellfina)	Fibrous septa (standardized dissection)	Multicenter studies: average reduction of about 2 points on the modified CSS scale (out of 6) within 3 months; >90% of patients showed at least 1-grade improvement; 94% satisfied with results; GAIS showed 98–100% with noticeable/significant improvement. Effect sustained at 1-year follow-up [3]
Laser-assisted subcision (Cellulaze, 1440 nm)	Septa + dermis + superficial fat	In 76–96% of treated areas: at least 1-grade improvement on a 5-point scale; after 1 year, 90% of areas maintained ≥1-grade improvement; 3D analysis showed nearly 50% reduction in dimple severity and about two-thirds improvement in

		contour. Effect shown to last at least 12 months based on available data [3]

Note: systematized by the author based on sources [3; 4]

Based on the analysis, it can be concluded that the effectiveness of hardware methods for cellulite correction is determined not so much by the intensity or invasiveness of the intervention, but by the correspondence of the mechanism of action of a particular technology to the dominant morphological factors of the formation of cellulite deformities in a particular patient. According to the author, methods aimed primarily at dermal stimulation or drainage processes provide limited and often temporary improvement in the appearance of the skin, while technologies that directly eliminate fibrous septa (subcision) demonstrate the most stable and reproducible results in severe forms of cellulite. Thus, monotherapy with hardware methods cannot be considered a universal solution, and combined protocols should be considered a pathogenetically justified standard for the correction of moderate and severe cellulite.

The visualization in Fig. 1 emphasizes the impossibility of complete correction of cellulite by influencing only one structural level and justifies the feasibility of combined therapeutic approaches.

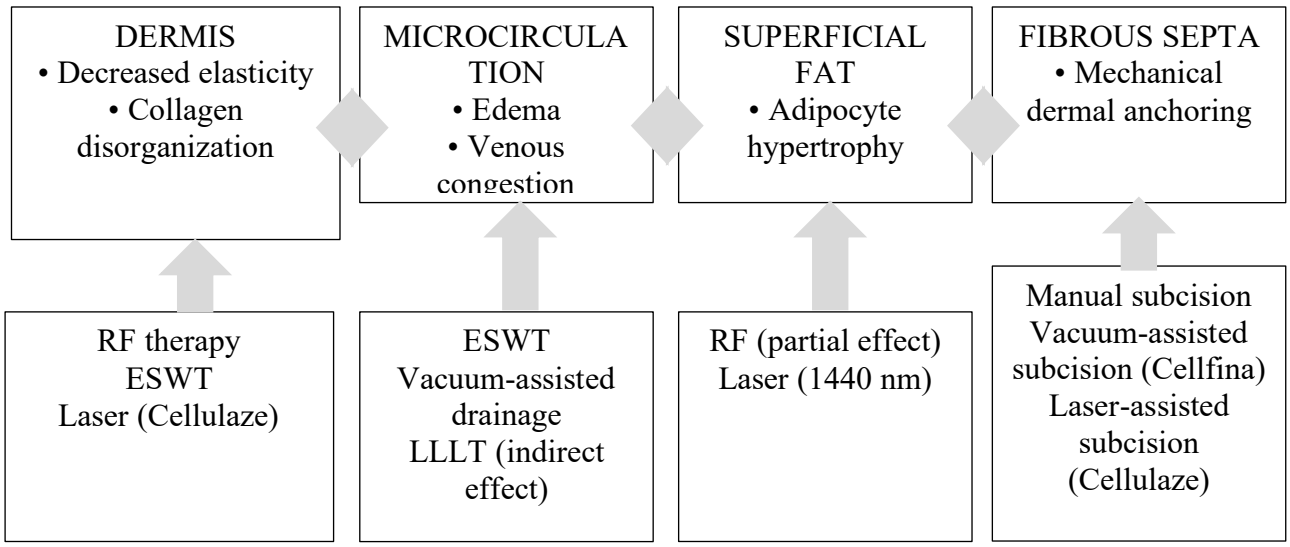

Fig.1. Morphological targets vs hardware methods

After comparing the effectiveness and limitations of individual techniques, combined protocols acquire special importance, since they allow for simultaneous influence on different pathomorphological components of cellulite (dermal matrix, microcirculatory-lymphatic component, superficial fat and fibrous septa), which are not corrected equally effectively within the framework of monotherapy. That is why specialized clinics usually form multicomponent schemes using several hardware platforms and techniques, combining hardware, mechanical and other interventions in accordance with the morphology of cellulite, skin condition and availability of technologies in a particular institution.

Conclusions. Summarizing the available data, we can conclude that the effectiveness of hardware methods for correcting cellulite is largely determined by which link of its morphology the influence is directed at. Methods that act primarily by improving microcirculation and lymphatic drainage, such as shockwave therapy and vacuum-assisted massage, usually provide smoothing of microrelief and reduction of swelling, which is clinically perceived as a moderate improvement in the appearance of the skin. At the same time, such effects are often variable or temporary and are not always accompanied by stable changes in body volume or weight.

Radiofrequency therapy occupies an intermediate position between drainage and structural approaches. Due to controlled heating, it improves skin density and tone, can reduce surface waviness and in some cases affect the thickness of subcutaneous fat. However, the severity of cellulite correction in this case, as a rule, remains moderate, and the long-term stability of the results is inconsistent. The most predictable and reproducible effect on cellulite "pits" themselves is provided by methods aimed at fibrous septa. Subcision technologies – both manual and hardware standardized – directly eliminate mechanical fixation of the dermis, which leads to a stable reduction in the depth and number of depressions and the preservation of results over a long period of time. Laser-assisted subcision additionally combines this effect with remodeling of the dermis

and superficial fat layer, which allows simultaneously to smooth the relief and improve skin tone. Low-intensity laser therapy and vibration exercises have a more indirect nature of action. Their impact is realized through changes in body composition, muscle activity and local perfusion, which may be accompanied by some improvement in appearance, but does not provide stable structural correction of cellulite. In this context, such approaches should be considered as auxiliary components of comprehensive programs, rather than as independent solutions.

In general, the choice of cellulite correction method should be based on an understanding of the dominant morphological component, the patient's expectations, and the need to achieve either a short-term aesthetic effect or a more permanent structural reorganization of the tissues.

Practical and Clinical Impact. The obtained results have direct practical significance for clinical aesthetic medicine, as they allow for a reasonable choice of hardware methods for cellulite correction depending on the dominant morphological changes in the dermal-subcutaneous complex. The use of pathogenetically oriented and combined protocols based on the presented analysis contributes to an increase in the predictability of the clinical outcome, the duration of the effect, and the level of patient satisfaction.

References

1. Bani D., Li A.Q., Freschi G., Russo G.L. Histological and ultrastructural effects of Ultrasound-induced cavitation on human skin adipose tissue. Plast Reconstr Surg Glob Open, 2013, №1, e41. DOI: https://doi.org/10.1097/GOX.0b013e3182a7f222

2. Duncan D.I., Kim T.H.M., Temaat R. A prospective study analyzing the application of radiofrequency energy and high-voltage, ultrashort pulse duration electrical fields on the quantitative reduction of adipose tissue. J Cosmet

Laser Ther, 2016, №18, 257–267. DOI: https://doi.org/10.3109/14764172.2016.1157368

3. Friedmann D.P., Vick G.L., Mishra V. Cellulite: A Review with a Focus on Subcision. Clinical, Cosmetic and Investigational Dermatology, 2017. URL: https://www.dovepress.com/cellulite-a-review-with-a-focus-on-subcision-peer-reviewed-fulltext-article-CCID

4. Gabriel A., Chan V., Caldarella M., Wayne T., O'Rorke E. Cellulite: Current Understanding and Treatment. Aesthet Surg J Open Forum, 2023, №5. URL: https://pubmed.ncbi.nlm.nih.gov/37424836/

5. Haykal D., Sattler S., Verner I., Madhumita M., Cartier H. A Systematic Review of High-Intensity Focused Ultrasound in Skin Tightening and Body Contouring. Aesthet Surg J, 2025, №45(7), 690–698. DOI: https://doi.org/10.1093/asj/sjaf053

6. Hugul H., Oba M.Ç., Kutlubay Z. Efficacy of Focused Radiofrequency and Ultrasound in Body Contouring: A Clinical Study. Journal of Cosmetic Dermatology, 2020. DOI: https://doi.org/10.1111/jocd.13896

7. Luebberding S., Krueger N., Sadick N.S. Cellulite: an evidence-based review. Am J Clin Dermatol, 2015, №16(4), 243–256. URL: https://pubmed.ncbi.nlm.nih.gov/25940753/

8. Piłat P., Szpila G., Stojko M., Nocoń J., Smolarczyk J., Żmudka K., Moll M., Hawranek M. Modern and Non-Invasive Methods of Fat Removal. Medicina (Kaunas), 2023, №59(8), 1378. DOI: https://doi.org/10.3390/medicina59081378

9. Sohn Y.J., Chun H. Ultrasound and high frequency equipment efficacy for abdominal obesity reduction in women. Sci Rep, 2025, №15(1), 17500. DOI: https://doi.org/10.1038/s41598-025-99361-6

10. Young V.L., DiBernardo B.E. Comparison of Cellulite Severity Scales and Imaging Methods. Aesthetic Surgery Journal, 2021, №41(6), NP521–NP537. DOI: https://doi.org/10.1093/asj/sjaa226