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Non-Invasive treatments for cellulite management

Eleni Sfyri^{1,*} , Niki Tertipi¹ 

¹Department of Biomedical Sciences, School of Health and Care Sciences, University of West Attica, Athens, Greece

*Corresponding author: Eleni Sfyri, Department of Biomedical Sciences, School of Health and Care Sciences, University of West Attica, Athens, Greece; e-mail: elsfyri@uniwa.gr

ABSTRACT

Cellulite treatments vary in their mechanisms, invasiveness, and durability of outcomes. Non-invasive options, such as topical agents and oral supplements, provide moderate benefits but require prolonged use. Massage and energy-based therapies offer better cosmetic improvements but often require multiple sessions with results that may not be long-lasting. Invasive treatments, like subcision and injectable options, directly address structural issues underlying cellulite. The choice of treatment depends on individual patient needs, cellulite severity, and the desired balance between invasiveness and results. A tailored approach considering the underlying structural and aesthetic concerns often yields the best outcomes.

KEYWORDS

cellulite, non-invasive methods, topical agents, energy-based therapy, cellulite management

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1. INTRODUCTION

Various agents and devices involved in the development of cellulite are currently available. These non-invasive treatments aim to reduce or improve the appearance of cellulite. These include topical treatments, oral supplements, massage and physical activity and, energy-based devices, (such as radiofrequency or light therapy). Treatments for cellulite have evolved over time, starting with topical treatments and massage, which focused on improving microcirculation and drainage. Newer treatments, such as radiofrequency, acoustic wave therapy and subcision, aim to address the structural disturbances that contribute to the formation of cellulite [1].

2. TOPICAL AGENTS

Topical treatments have been among the earliest approaches used for cellulite. A variety of creams and gels are available, typically containing a combination of ingredients like such as aminophylline, theophylline, caffeine, retinol, and botanical ex-

tracts. These ingredients are claimed to stimulate cutaneous microcirculation, support dermal neocollagenesis, facilitate lipolysis, suppress lipogenesis, alleviate inflammation and oxidative stress, and promote lymphatic drainage and the reduction of edema [2].

The most studied ingredients are caffeine and retinol. Caffeine works by inhibiting phosphodiesterase, which stimulates lipolysis, boosts skin circulation, and provides antioxidant benefits. Retinoids, on the other hand, help by thickening the dermis, promoting angiogenesis, stimulating connective tissue synthesis, and increasing fibroblast activity. Several studies have reported significant improvements in cellulite appearance with caffeine and/or retinol, which contain topical preparations. However, these studies were generally limited in size and duration. A meta-analysis of topical treatments for cellulite reduction found moderate efficacy in decreasing thigh circumference. Despite the promising results, none of these topical formulations are FDA-approved for cellulite treatment due to insufficient clinical evidence of their long-term effectiveness [3].

3. ORAL SUPPLEMENTS

A wide range of oral supplements are promoted for enhancing skin appearance and potentially minimizing cellulite. These include extracts of *Centella asiatica*, *Vitis vinifera*, *Melilotus officinalis*, *Ginkgo biloba*, fish oil, *Fucus vesiculosus*, and borage oil. These supplements are believed to have antioxidant effects, which might contribute to cellulite treatment. For instance, Aronia juice is believed to boost cellular metabolism, stimulate collagen and elastin production, minimize edema, and enhance microcirculation, potentially diminishing the appearance of cellulite. Although clinical evidence for the effectiveness of these supplements is minimal and none of them are FDA-approved, A noteworthy study demonstrated a significant reduction in cellulite severity and improvement in skin appearance in women with moderate cellulite after taking oral collagen supplements for six months [1].

4. MASSAGE AND PHYSICAL ACTIVITY

Massage is an ancient method used to treat cellulite, with the goal of enhancing lymphatic drainage and boosting microcirculation, which is often impaired in individuals with cellulite. This treatment can be performed manually or using mechanical devices. While manual massage is rare in clinical practice, the endodermic massage system is an

FDA-approved mechanical massage device designed for cellulite treatment. The therapy combines rollers' positive and negative pressure with suction to target the skin and subcutaneous tissue, aiming to redistribute adipocytes and improve skin contour. A study of 15 sessions of 30 to 45 minutes each and conducted twice a week, demonstrated a significant enhancement in the appearance of cellulite. However, the longevity of these effects has not been well-established [4,5].

A sedentary lifestyle and lack of physical activity exacerbate cellulite by weakening the muscles and impairing blood circulation, leading to localized blood stasis, which results in secondary hypoxia and ischemia of adipose tissue. Physical activity helps improve the appearance of cellulite by controlling body weight and increasing muscle mass. Combined approaches, such as aerobic exercise combined with phototherapy, have shown significant reductions in hip and thigh circumference as well as cellulite. Cycling with pressure applied to the lower limbs, combined with a proper diet, can enhance regional fat loss and reduce cellulite severity. The combination of Pilates and massage can help maintain body fat percentages within normal ranges and increase muscle mass. Optimal results are achieved when combined with a proper diet [5,6].

5. ENERGY – BASED AND ACOUSTIC WAVE THERAPY

Energy-based devices have been extensively researched for their ability to treat localized fat and skin laxity, two factors that contribute to the cellulite appearance.

Radiofrequency (RF) devices apply thermal energy to the targeted area through electrodes. This energy warms the dermis and subcutaneous layers, triggering collagen breakdown, remodeling, and the formation of new collagen, all of which contribute to skin tightening. Different RF devices use various parameters, such as energy density, exposure time, and polarity. Newer generation devices, such as multipolar and temperature-controlled RF systems, provide deeper tissue penetration, leading to more effective results. RF devices are often combined with other technologies like infrared light, vacuum suction, or pulsed electromagnetic fields to improve their effectiveness. In clinical studies, numerous RF systems have been demonstrated to effectively reduce the appearance of cellulite. Some of these devices are FDA-approved for cellulite treatment. However, the main limitation of RF therapy is that it typically requires multiple sessions to see visible results, and the effects tend to

be short-lived. RF therapy can also cause bruising, though this typically resolves over time [1].

Light and Laser Therapy devices, function by delivering thermal energy to the targeted tissue. The depth of penetration depends on the wavelength of the light or laser used. This energy stimulates collagen remodeling and increases microcirculation, which may improve the appearance of cellulite. While several studies have examined light/laser treatments, the results have been inconclusive. Some devices, such as intense pulsed light and the 810 nm diode laser, have shown mild improvements in cellulite appearance, but the requirement for multiple sessions and the absence of long-term results continue to be limitations. A low-level laser therapy (LLLT) using a green 532 nm diode was found to improve cellulite appearance after six treatments of 30-minutes. The long-pulsed 1064 nm Nd:YAG laser also showed mild-to-moderate improvement after three treatments spaced four weeks apart. These findings suggest that laser therapy may have some benefit, but more research is needed to confirm its efficacy and durability [7,8,9].

Acoustic Wave Therapy is commonly used to treat musculoskeletal injuries, and it is also effective in improving lymphatic drainage, skin microcirculation and neo-collagenesis, which help improve cellulite appearance. The two main types of acoustic waves used are radial shock waves and focused shock waves (extracorporeal shock wave therapy or ESWT). Radial waves have low energy and affect superficial tissue, while focused shock waves are high-energy that penetrate deeper into the tissue. Several studies have reported improvements in the appearance of cellulite, although six to eight treatment sessions are typically required to see visible changes. The long-term durability of results beyond one year remains unclear [10].

6. CONCLUSION

Various treatments for cellulite target its underlying mechanisms, ranging from topical agents and oral supplements to physical activity, massage, and energy-based therapies. While many approaches show promising short-term improvements, their long-term efficacy and durability vary. Combining treatments, such as exercise with proper diet or energy-based devices with massage, often yields better results. However, more research is needed to establish standardized protocols and confirm the effectiveness of these methods, particularly for sustained cellulite reduction and skin appearance improvement.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

REFERENCES

- Gabriel A., Chan V., Caldarella M., Wayne T., O'Rorke E.: Cellulite: Current Understanding and Treatment. *Aesth. Surg. J. Open Forum* 5: 1–13 (2023). DOI: [10.1093/asjof/ojad050](https://doi.org/10.1093/asjof/ojad050)
- Pérez Atamoros F.M., Alcalá Pérez D., Asz Sigall D., Avila Romay A.A., Jose A. Barba Gastelum J.A., de la Pena Salcedo J.A., et al.: Evidence-based treatment for gynoid lipodystrophy: a review of the recent literature. *J. Cosmet. Dermatol.* 17(6): 977-983 (2018). DOI: [10.1111/jocd.12555](https://doi.org/10.1111/jocd.12555)
- Sadick N. Treatment for cellulite.: *Int. J. Women. Dermatol.* 5(1): 68-72 (2018). DOI: [10.1016/j.ijwd.2018.09.002](https://doi.org/10.1016/j.ijwd.2018.09.002)
- Kutlubay Z., Songur A., Engin B., Khatib R., Calay Ö., Serdaroğlu S.: An alternative treatment modality for cellulite: LPG endermologie. *J. Cosmet. Laser Ther.* 15(5):266-2670 (2013). DOI: [10.3109/14764172.2013.787801](https://doi.org/10.3109/14764172.2013.787801)
- Sfyri E., Tertipi N., Biskanaki F., Andreou E., Chaniotis D., Rallis E., Kefala V.: Athletes' performance increasing techniques through application of aesthetics procedures. *Rev. Clin. Pharm. Pharmac. Int. Ed.* 38 (Sup1): 81-86 (2024). DOI: [10.61873/EZEA1091](https://doi.org/10.61873/EZEA1091)
- Dzimbova T., Marinska R.: Influence of the pilates method and anti-cellulite massage for maintaining healthy body composition parameters. *Merit Res. J. Med. Medic. Sciences* 10(10): 249-256 (2022).
- Biskanaki F., Rallis F., Andreou E., Sfyri E., Tertipi N., Ninos G., Kefala V.: Laser Innovations in Aesthetics. *Rev. Clin. Pharm. Pharmac. Int. Ed.* 38 (Sup1): 17-21 (2024). DOI: [10.61873/COBD5903](https://doi.org/10.61873/COBD5903)
- Arora G., Patil A., Hooshanginezhad Z, Fritz K., Salavastru C., et al.: Cellulite: presentation and management. *J. Cosmet. Dermatol.* 21(4): 1393-1401 (2022). DOI: [10.1111/jocd.14815](https://doi.org/10.1111/jocd.14815)
- Bass L. S., Kaminer M. S. Insights into the pathophysiology of cellulite: a review. *Dermatol. Surg.* 46 Suppl1(1): S77-S85 (2020). DOI: [10.1097/DSS.0000000000002388](https://doi.org/10.1097/DSS.0000000000002388)

10. Hessel D. M., Dal 'forno T., Hessel C. L.: A validated photometric cellulite severity scale. *J. Eur. Acad. Dermatol. Venereol.* 23(5): 523-528 (2009).
DOI: [10.1111/j.1468-3083.2009.03101.x](https://doi.org/10.1111/j.1468-3083.2009.03101.x).