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UPRAVLJANJE TERAPIJOM LASEROM NISKOG INTENZITETA I URAVNOTEŽENA ISHRANA U FUNKCIJI SMANJENJA TELESNE MASE I OBLIKOVANJE TELA

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Gojaznost predstavlja značajan globalni zdravstveni izazov koji zahteva efikasne, bezbedne i održive strategije lečenja. Ovaj sistematski pregled ima za cilj da proceni delotvornost terapije laserom niskog intenziteta (LLLT) u kombinaciji sa uravnoteženom ishranom u smanjenju telesne mase i oblikovanju tela. Pregled je sproveden u skladu sa PRISMA smernicama, analizom relevantnih studija iz baza podataka *PubMed*, *Cochrane Library* i *Scopus*, sa fokusom na randomizovane kontrolisane i kliničke studije koje uključuju odrasle osobe sa prekomernom telesnom masom ili gojaznošću.

Rezultati ukazuju da LLLT predstavlja efikasnu neinvazivnu metodu za redukciju lokalizovanih masnih naslaga, posebno kada se kombinuje sa strukturiranim dijetetskim intervencijama. Ova kombinacija omogućava sinergistički efekat – LLLT podstiče lipolizu i metaboličke procese, dok uravnotežena ishrana obezbeđuje dugoročnu kontrolu telesne mase i poboljšanje opšteg zdravlja. Pored fizičkih ishoda, uočeno je i značajno poboljšanje psiholoških faktora, uključujući motivaciju, samopouzdanje i percepciju telesne slike.

Međutim, efikasnost intervencije varira u zavisnosti od individualnih karakteristika kao što su starost, pol i metabolizam, što ukazuje na potrebu za personalizovanim pristupom. Održivost

rezultata zahteva kontinuirano pridržavanje dijetetskih preporuka, podršku zdravstvenih stručnjaka i eventualne dodatne terapijske sesije.

Zaključno, kombinacija terapije laserom niskog intenziteta i uravnotežene ishrane predstavlja obećavajuću, bezbednu i efikasnu strategiju za smanjenje telesne mase i oblikovanje tela. Dalja istraživanja su neophodna radi optimizacije protokola i procene dugoročnih efekata ove integrisane terapije.

Ključne reči: upravljanje terapijom laserom niskog intenziteta, terapija laserom niskog inteziteta, neinvazivna redukcija masti, dijetetski menadžment, PRISMA

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MANAGEMENT OF LOW-INTENSITY LASER THERAPY AND BALANCED NUTRITION IN THE FUNCTION OF BODY WEIGHT REDUCTION AND BODY SHAPING

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Obesity is a major global health challenge that requires effective, safe, and sustainable treatment strategies. This systematic review aims to evaluate the effectiveness of low-intensity laser therapy (LLLT) in combination with a balanced diet in reducing body weight and improving body contouring. The review was conducted in accordance with PRISMA guidelines, analysing relevant studies from PubMed, the Cochrane Library, and Scopus, with a focus on randomized controlled trials and clinical studies involving adults who are overweight or obese.

The results indicate that LLLT is an effective non-invasive method for reducing localized fat deposits, particularly when combined with structured dietary interventions. This combination produces a synergistic effect—LLLT stimulates lipolysis and metabolic processes, while a balanced diet supports long-term weight management and overall health improvement. In addition to physical outcomes, significant improvements were observed in psychological factors, including motivation, self-confidence, and body image perception.

However, the effectiveness of the intervention varies depending on individual characteristics such as age, sex, and metabolic rate, highlighting the need for a personalized approach. The sustainability

of results requires continuous adherence to dietary recommendations, support from healthcare professionals, and, if necessary, additional therapy sessions.

In conclusion, the combination of low-intensity laser therapy and a balanced diet represents a promising, safe, and effective strategy for weight reduction and body contouring. Further research is needed to optimize treatment protocols and assess the long-term effects of this integrated approach.

Key words: management of low-intensity laser therapy, low intensity laser therapy, non-invasive fat reduction, dietary management, PRISMA

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Introduction

Obesity is a growing global health problem that requires effective interventions for reduction of body weight and for body contouring. Low-intensity laser therapies have emerged as a non-invasive option, while a balanced diet remains the cornerstone of weight management. This systematic review aims to evaluate the efficacy of low-intensity laser therapies in combination with a balanced diet on reduction of body mass and body contouring outcomes.¹⁻¹⁰

Materials and Methods

In accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, a comprehensive search was conducted across multiple data bases (PubMed, Cochrane Library, Scopus) in order to identify relevant studies published up to [19 January 2010]. Eligible studies included randomized controlled trials that assessed low-intensity laser therapy and balanced diet interventions for body mass control. Data on weight loss, anthropometric measurements and adverse effects were extracted and analyzed.¹⁰⁻¹⁶

Eligibility criteria for the review of low-intensity laser therapies and a balanced diet for the reduction of weight and body contouring:

Study design:

Inclusion: Randomized controlled trials (RCTs), non-randomized experimental studies, cohort studies and clinical trials.

Exclusion: Observational studies without intervention, case reports and non-peer-reviewed articles.

Participants:

Inclusion: Adults (aged 18 and older) with a Body Mass Index (BMI) of 25 or higher (overweight or obesity).

Exclusion: Individuals with contraindications to laser therapy (pregnancy, certain medical conditions) or those undergoing other interventions for the reduction of weight during the study period.

Interventions

Inclusion: Studies utilizing Low-intensity Laser therapy (LLLT) as the primary intervention, in combination with a structure program of a balanced diet.

Exclusion: Studies focusing exclusively on diet without laser therapy or laser therapy without a dietary component.

Outcomes

Inclusion: Studies reporting on primary outcomes such as a weight loss (percentage or kg), body measurements (waist circumference, body fat percentage) and secondary outcomes such as patient satisfaction and adverse effects.

Exclusion: Studies that do not provide measurable results related to reduction of body weight or body contouring.

Language and Publication Status

Inclusion: Articles published in English.

Exclusion: Non-English publications, abstracts or conference proceedings without full-text availability.

Time Frame

Inclusion: Studies published from [19 January 2010] to present date.

Exclusion: Older studies that may not reflect current methodologies or technologies.

Information sources for the review of low-intensity laser therapies and a balanced diet for the reduction of body weight and body contouring:

Data Bases

PubMed: For peer-reviewed articles in the field of medicine and health sciences.

Cochrane Library: For systematic reviews and controlled trials, specifically in health interventions.

Scopus: Access to a wide range of scientific articles from various fields.

Additional Sources

Clinical trial registers: for the identification of ongoing or unpublished clinical trials (ClinicalTrials.gov).

Conference proceedings, relevant abstracts and presentations from conferences focusing on obesity, nutrition and laser therapy

Keywords and Search Terms - a combination of keywords and MeSH (Medical Subject Headings) terms, such as: "Low-intensity laser therapy" (LLLT)", "Weight loss", "Body contouring", "Balanced diet", "Obesity treatment", "Non-invasive fat reduction", "Nutritional intervention", "Dietary management", „PRISMA“.

Quality Assessment and the risk of bias of the included studies was avoided by using established tools and criteria specific to the study design. Data Synthesis from individual studies was performed qualitatively – a narrative synthesis. Reporting – includes a flow diagram that illustrates the study selection process, methodology details, results, limitations and conclusions (Figure 1).

In the final analysis of the paper on the effectiveness of low-intensity laser therapies and a balanced diet for the reduction of body weight and body contouring, eleven references are critical in supporting the research questions and objectives. Together, these references provide strong support for the research goals, highlighting the effectiveness of low-intensity laser therapies and a balanced diet in achieving the reduction of weight and improved body contouring. Further research is encouraged in order to validate these findings and explore additional interventions. ¹⁷⁻²¹

Abbreviations

AR - Augmented Reality

CBT - Cognitive Behavioral Therapy

ESG - Endoscopic Sleeve Gastroplasty

HIFU - High-Intensity Focused Ultrasound

LILT - Low-Intensity Laser Therapy

LLLT – Low-intensity Laser Therapy

VR - Virtual Reality

MI – Motivational Interviewing

WHO – World Health Organization

Objectives

To assess the effectiveness of low-intensity laser therapy in promoting weight loss and body contouring when combined with a balanced diet.

To investigate the biological mechanisms through which low-intensity laser therapy facilitates fat reduction and improves metabolic processes.

To encourage adherence to a balanced diet and modification of a lifestyle as part of a comprehensive approach to weight management.

To measure patient satisfaction and quality of life improvements resulting from combined interventions.

To evaluate the safety and potential adverse effects of low-intensity laser therapy in combination with dietary changes.

To investigate the sustainability of weight loss and body contouring outcomes over time with the continued use of both therapies.

To provide insight and recommendations for future research in order to improve treatment protocols and establish optimal parameters for laser therapy and dietary interventions.

To contribute to evidence-based practices that healthcare providers can use to effectively address obesity and body contouring.

To provide a comprehensive understanding of the synergy between low-intensity laser therapy and dietary interventions, ultimately promoting effective strategies for the reduction of weight and body contouring.

Research Questions

How effective is Low-intensity Laser Therapy (LLLT) in reducing localized fat deposits compared to traditional weight loss methods?

What are the combined effects of Low-intensity Laser Therapy (LLLT) and a balanced diet on fat reduction in specific areas of the body?

What biochemical mechanisms are involved in fat cell metabolism following Low-intensity Laser Therapy (LLLT) and how do these mechanisms influence dietary interventions?

How is the reduction of fat deposits resulting from LLLT and dietary changes sustained over time and what factors influence the retention of these results?

How does incorporating a balanced diet alongside LLLT affect patient satisfaction and perceived body image?

How do changes in fat deposits resulting from LLLT combined with a balanced diet compare to those achieved through exclusive dietary interventions or physical exercise?

How do individual differences (age, sex, metabolic rate) affect the results of low-intensity laser therapy and dietary changes on fat deposits?

Which components of a balanced diet (macronutrient percentage composition, micronutrient intake) most significantly affect the effectiveness of LLLT in reducing fat deposits?

What factors contribute to patient adherence to dietary recommendations when undergoing low-intensity laser therapy and how does this compliance affect outcomes?

How do LLLT and dietary interventions jointly affect psychological factors related to weight loss, such as motivation, self-efficacy and body image perception?

Results and Discussion

Results based on research questions:

Low-intensity Laser Therapy (LLLT) offers an effective and non-invasive option for reducing localized fat deposits, especially when compared to traditional weight loss methods that target overall fat reduction.²¹

While LLLT can provide faster results and specifically address resistant areas, it is not a substitute for the sustainable lifestyle changes promoted by traditional methods.

For optimal results, a combination of LLLT and comprehensive dietary and exercise strategies may be the most effective approach for achieving and maintaining the desired body composition.²²

The combined effects of LLLT and a balanced diet create a powerful strategy for reduction of body fat.

By targeting localized fat deposits while promoting overall health and well-being through dietary changes, individuals can achieve more significant and sustainable weight loss.²³

This integrated approach not only enhances physical results but also supports the psychological and behavioral changes that contribute to long-term success in weight management.

Biochemical mechanisms activated by LLLT significantly affect fat cell metabolism by promoting lipolysis, enhancing mitochondrial function and improving insulin sensitivity.²⁴⁻³⁰

These effects create a favorable environment for dietary interventions, facilitating fat loss and improving overall metabolic health.

By understanding these mechanisms, practitioners can better design integrated approaches that combine LLLT and dietary strategies for optimal weight management results.³¹

Maintaining the fat reduction achieved through LLLT and dietary changes requires a multifaceted approach that includes adherence to compliance, psychological support, monitoring, lifestyle integration and potentially ongoing LLLT sessions.

By focusing on these factors, individuals can create a sustainable plan that helps them maintain their weight loss results and promotes long-term health.³²

Incorporating a balanced diet with LLLT significantly increases patient satisfaction and improves perceived body image.

The combination provides visible results, encourages holistic health improvements, boosts self-esteem, promotes sustainable lifestyle changes and fosters social support. ³³⁻³⁶

Together, these factors contribute to a positive self-perception and a more fulfilling weight management way.

The combination of LLLT and a balanced diet generally leads to more effective and sustainable changes in body fat compared to dietary interventions or exercise alone. ^{37, 38}

LLLT provides targeted fat reduction with faster visible results, while a balanced diet supports overall health and metabolic function.

Together, they create a synergistic effect that enhances motivation, satisfaction and long-term adherence, making it a compelling approach for individual seeking to manage their body composition effectively.

Individual differences such as age, sex and metabolic rate significantly affect the efficacy of LLLT and dietary changes on fat deposits. ³⁹⁻⁴²

Older adults may experience slower fat loss due to reduced metabolism and hormonal changes. ⁴³

Sex differences, driven by hormonal profiles, affect fat distribution and dietary response, with men and women reacting differently to interventions. ⁴⁴

Metabolic rate affects calorie expenditure; those with higher rates may achieve better results from both LLLT and dietary changes, highlighting the need for personalized approaches to optimize fat loss. ⁴⁵

The efficacy of LLLT in reducing fat deposits is considerably affected by dietary components. A balanced macronutrient composition – moderate carbohydrates, a higher protein ratio to preserve muscle and healthy fats– supports metabolic health and enhances fat loss. ⁴⁶

Micronutrients also play a crucial role; vitamins and minerals (such as vitamin D and B vitamins) are vital for metabolism, while antioxidants (such as vitamins C and E) can enhance cellular recovery and LLLT response. ⁴⁷

A well-planned diet is essential for optimizing LLLT outcomes in fat reduction.

Several factors contribute to patient adherence to dietary recommendations during low-intensity laser therapy:

Understanding the benefits of dietary changes can increase motivation and commitment.

Access to healthcare providers, family and peer support can foster adherence (compliance).

Tailoring dietary plans to individual preferences increases the likelihood of adherence.

Goal setting, progress tracking and addressing obstacles can enhance adherence (compliance).

Motivation, self-efficacy and mindset play a significant role in commitment to dietary changes.⁴⁸⁻⁵⁴

Combination of LLLT and dietary interventions positively affects psychological factors related to weight loss:

Visible LLLT results can boost motivation to adhere to dietary changes, creating a reinforcing cycle of success.

Achieving fat loss increases individuals' confidence in their ability to manage body weight and develop nutrition-related skills, enhancing their belief in success.

Effective fat reduction can improve body image and self-esteem, leading to a more positive self-perception and a healthier lifestyle.⁵⁴⁻⁵⁸

Conclusion

Low Intensity Laser Therapy (LILT) and dietary interventions offer a synergistic approach to body weight management and fat reduction. By combining the immediate effects of LILT, which stimulates fat burning and promotes localized fat loss, with the long-term benefits of structured body changes, individuals can achieve more significant and sustainable results comprising of:

Enhanced efficiency: Integration of LILT with dietary modifications can accelerate fat loss, boost motivation and improve adherence to healthy dietary habits, leading to a more effective weight management strategy.

Psychological benefits: Both therapies positively affect psychological factors such as motivation, self-efficacy and self-perception. Improved body perception and increased confidence can reinforce commitment to lifestyle changes.

Personalization: Individual differences — including age, sex and metabolic rate, highlight the need for personalized approaches. Tailoring the treatment to unique needs of each patient improves compliance and results.

Ongoing support: Continuous support from healthcare providers, including physicians, nutritionists and therapists, is crucial for maintaining adherence (compliance) to dietary interventions and maximizing the benefits of LILT.

Future research: While current evidence supports the efficacy of combining LILT with dietary interventions, further research is necessary in order to optimize protocols, understand long-term effects and explore psychological impact of these combined therapies.

The combination of low-intensity laser therapy and dietary interventions represents a comprehensive strategy for achieving and maintaining body weight loss, ultimately leading to improved overall health and well-being.

Literature

1. Cox SE, Butterwick K. Introduction to Body Contouring Special Issue. *Dermatol Surg*. 2020 Oct;46 Suppl 1:S1.
2. Smith J, Ang XQ, Giles EL, Traviss-Turner G. Emotional Eating Interventions for Adults Living with Overweight or Obesity: A Systematic Review and Meta-Analysis. *Int J Environ Res Public Health*. 2023 Feb 3;20(3):2722.
3. Kossoff EH. The Modified Atkins Diet for Epilepsy: Two Decades of an "Alternative" Ketogenic Diet Therapy. *Pediatr Neurol*. 2023 Oct;147:82-87.
4. Gardner CD, Kiazand A, Alhassan S, Kim S, Stafford RS, Balise RR, Kraemer HC, King AC. Comparison of the Atkins, Zone, Ornish, and LEARN diets for change in weight and related risk factors among overweight premenopausal women: the A TO Z Weight Loss Study: a randomized trial. *JAMA*. 2007 Mar 7;297(9):969-77.
5. Atkins CGK, Das S. Rebuttal From Drs Atkins and Das. *Chest*. 2024 Aug;166(2):256
6. Singh B, Keaney T, Rossi AM. Male Body Contouring. *J Drugs Dermatol*. 2015 Sep;14(9):1052-9.
7. Wu YK, Berry DC. Impact of weight stigma on physiological and psychological health outcomes for overweight and obese adults: A systematic review. *J Adv Nurs*. 2018 May;74(5):1030-1042.
8. Murgia RD, Noell C, Weiss M, Weiss R. Body contouring for fat and muscle in aesthetics: Review and debate. *Clin Dermatol*. 2022 Jan-Feb;40(1):29-34.
9. Wat H, Wu DC, Goldman MP. Noninvasive Body Contouring: A Male Perspective. *Dermatol Clin*. 2018 Jan;36(1):49-55.
10. Cao B, Xu J, Li R, Teopiz KM, McIntyre RS, Chen H. Interventions targeting comorbid depression and overweight/obesity: A systematic review. *J Affect Disord*. 2022 Oct 1;314:222-232.
11. Yu NZ, Zhou Y, Huang JZ, Long X, Wang XJ. [Body Contouring After Bariatric Surgery]. *Zhongguo Yi Xue Ke Xue Yuan Xue Bao*. 2018 Oct 30;40(5):591-596.
12. Rosenfield LK, Davis CR. Evidence-Based Abdominoplasty Review With Body Contouring Algorithm. *Aesthet Surg J*. 2019 May 16;39(6):643-661.
13. Golden A. Obesity's Impact. *Nurs Clin North Am*. 2021 Dec;56(4):xiii-xiv. doi: 10.1016/j.cnur.2021.08.004.
14. Sclafani AP. Paradoxical Adipose Hyperplasia after Cryolipolysis CoolSculpting. *Facial Plast Surg*. 2023 Oct;39(5):586-587.
15. Agochukwu-Nwubah N, Mentz H. Paradoxical adipose hyperplasia after noninvasive radiofrequency treatment: A novel report and review. *J Cosmet Dermatol*. 2020 Apr;19(4):866-868.
16. Morrison SD, Wilson SC, Mosser SW. Breast and Body Contouring for Transgender and Gender Nonconforming Individuals. *Clin Plast Surg*. 2018 Jul;45(3):333-342.
17. Fisher M. Foreword: Evaluation and management of overweight and obesity in children and adolescents. *Curr Probl Pediatr Adolesc Health Care*. 2020 Sep;50(9):100872.
18. Amarin MN, Atallah AA, Rashdan MZA, Atallah IA, Khrais MM, Jaber YH, Atallah AA, Ismail OM, Jaber KA, Fkheideh TK, Altaher RN. Body contouring after bariatric surgeries in Jordan: Awareness, prevalence, and challenges: A multicentric cross-sectional study. *Medicine (Baltimore)*. 2023 Aug 18;102(33):e34279.
19. Derderian SC, Patten L, Kaizer AM, Inge TH, Jenkins TM, Michalsky MP, Xie C, Dewberry LC, Sitzman TJ. Body contouring in adolescents after bariatric surgery. *Surg Obes Relat Dis*. 2020 Jan;16(1):137-142.
20. Alberga AS, Sigal RJ, Goldfield G, Prud'homme D, Kenny GP. Overweight and obese teenagers: why is adolescence a critical period? *Pediatr Obes*. 2012 Aug;7(4):261-73.
21. Kanchan S, Gaidhane A. Social Media Role and Its Impact on Public Health: A Narrative Review. *Cureus*. 2023 Jan 13;15(1):e33737.
22. Bessell E, Markovic TP, Fuller NR. How to provide a structured clinical assessment of a patient with overweight or obesity. *Diabetes Obes Metab*. 2021 Feb;23 Suppl 1:36-49.

23. Nadhreen AA, Alamoudi NM, Elkhodary HM. Low-intensity laser therapy in dentistry: Extra-oral applications. *Niger J Clin Pract.* 2019 Oct;22(10):1313-1318.
24. Ivandic T. Low-intensity Laser Therapy. *Dtsch Arztebl Int.* 2021 Feb 5;118(5):69.
25. Yeh SW, Hong CH, Shih MC, Tam KW, Huang YH, Kuan YC. Low-intensity Laser Therapy for Fibromyalgia: A Systematic Review and Meta-Analysis. *Pain Physician.* 2019 May;22(3):241-254.
26. Zecha JA, Raber-Durlacher JE, Nair RG, Epstein JB, Sonis ST, Elad S, Hamblin MR, Barasch A, Migliorati CA, Milstein DM, Genot MT, Lansaat L, van der Brink R, Arnabat-Dominguez J, van der Molen L, Jacobi I, van Diessen J, de Lange J, Smeele LE, Schubert MM, Bensadoun RJ. Low level laser therapy/photobiomodulation in the management of side effects of chemoradiation therapy in head and neck cancer: part 1: mechanisms of action, dosimetric, and safety considerations. *Support Care Cancer.* 2016 Jun;24(6):2781-92.
27. Ren C, McGrath C, Jin L, Zhang C, Yang Y. The effectiveness of low-intensity laser therapy as an adjunct to non-surgical periodontal treatment: a meta-analysis. *J Periodontol Res.* 2017 Feb;52(1):8-20.
28. Datana S, Agarwal SS, Bhandari SK. Low-intensity laser therapy. *Am J Orthod Dentofacial Orthop.* 2021 Apr;159(4):404.
29. Moskvina SV. Low-intensity Laser Therapy and Light Energy. *Photobiomodul Photomed Laser Surg.* 2019 May;37(5):267-268.
30. Biala M. Low-intensity Laser Therapy: A Literature Review of the Prevention and Reduction of Oral Mucositis in Patients Undergoing Stem Cell Transplantation. *Clin J Oncol Nurs.* 2022 Jun 1;26(3):293-299.
31. Zarei M, Wikramanayake TC, Falto-Aizpurua L, Schachner LA, Jimenez JJ. Low level laser therapy and hair regrowth: an evidence-based review. *Lasers Med Sci.* 2016 Feb;31(2):363-71.
32. Bensadoun RJ, Nair RG. Efficacy of low-intensity laser therapy (LLLT) in oral mucositis: what have we learned from randomized studies and meta-analyses? *Photomed Laser Surg.* 2012 Apr;30(4):191-2.
33. Fakhouri TM, El Tal AK, Abrou AE, Mehregan DA, Barone F. Laser-assisted lipolysis: a review. *Dermatol Surg.* 2012 Feb;38(2):155-69.
34. Shavit E, Wollina U, Alavi A. Lipoedema is not lymphoedema: A review of current literature. *Int Wound J.* 2018 Dec;15(6):921-928.
35. Kroumpouzou G, Arora G, Kassir M, Galadari H, Wollina U, Lotti T, Grabbe S, Goldust M. Carboxytherapy in dermatology. *Clin Dermatol.* 2022 May-Jun;40(3):305-309.
36. May BL, Kenkel JM. Commentary on: Abdominal Laser Lipolysis Using a Microprocessor-Controlled Robotic Arm With Noncontact Heating and Cooling. *Aesthet Surg J.* 2021 Nov 12;41(12):NP1962-NP1964.
37. Steinert M. Physikalische Lipolyse [Physical lipolysis]. *Hautarzt.* 2010 Oct;61(10):856-63.
38. 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 Jul 28;59(8):1378.
39. Palm MD, Goldman MP. Laser lipolysis: current practices. *Semin Cutan Med Surg.* 2009 Dec;28(4):212-9.
40. Theodorou SJ, Martin WJ. Laser lipolysis with 924- and 975-nm laser diodes in the lower extremities. *Aesthetic Plast Surg.* 2013 Apr;37(2):254-5.
41. Mordon S, Plot E. Laser lipolysis versus traditional liposuction for fat removal. *Expert Rev Med Devices.* 2009 Nov;6(6):677-88.
42. Wolska J, Hassan H. Noninvasive lipolysis modalities in aesthetic medicine. *J Cosmet Dermatol.* 2023 Oct;22(10):2635-2649.
43. Schilling L, Saedi N, Weiss R. 1060 nm Diode Hyperthermic Laser Lipolysis: The Latest in Non-Invasive Body Contouring. *J Drugs Dermatol.* 2017 Jan 1;16(1):48-52.
44. Azadgoli B, Baker RY. Laser applications in surgery. *Ann Transl Med.* 2016 Dec;4(23):452.
45. Badin AZ, Moraes LM, Gondek L, Chiaratti MG, Canta L. Laser lipolysis: flaccidity under control. *Aesthetic Plast Surg.* 2002 Sep-Oct;26(5):335-9.
46. Wolfenson M, Hochman B, Ferreira LM. Laser lipolysis: skin tightening in lipoplasty using a diode laser. *Plast Reconstr Surg.* 2015 May;135(5):1369-1377.

47. Lee JY, Oh SW, Ryu HY, Seo YS. Development of a Minimally Invasive and Non-invasive Lipolysis Laser System for Effective Fat Reduction. *J Lasers Med Sci*. 2021 Oct 3;12:e55.
48. Zelickson BD, Dressel TD. Discussion of laser-assisted liposuction. *Lasers Surg Med*. 2009 Dec;41(10):709-13.
49. Gentile RD. Laser-Assisted Facelifting and Energy-Based Rejuvenation Techniques During Rhytidectomy. *Facial Plast Surg Clin North Am*. 2020 Aug;28(3):379-396.
50. Okhovat JP, Alavi A. Lipedema: A Review of the Literature. *Int J Low Extrem Wounds*. 2015 Sep;14(3):262-7.
51. Avci P, Nyame TT, Gupta GK, Sadasivam M, Hamblin MR. Low-intensity laser therapy for fat layer reduction: a comprehensive review. *Lasers Surg Med*. 2013 Aug;45(6):349-57.
52. Neira R, Ortiz-Neira C. Low-intensity laser-assisted liposculpture: Clinical report of 700 cases. *Aesthet Surg J*. 2002;22(5):451-455.
53. Caruso-Davis MK, Guillot TS, Podichetty VK, Mashtalir N, Dhurandhar NV, Dubuisson O, Yu Y, Greenway FL. Efficacy of low-intensity laser therapy for body contouring and spot fat reduction. *Obes Surg*. 2011;21(6):722-729.
54. Jackson RF, Stern FA, Neira R, Ortiz-Neira CL, Maloney J. Application of low-intensity laser therapy for noninvasive body contouring. *Lasers Surg Med*. 2012 Mar;44(3):211-7.
55. Jankowski M, Gawrych M, Adamska U, Ciescinski J, Serafin Z, Czajkowski R. Low-intensity laser therapy (LLLT) does not reduce subcutaneous adipose tissue by local adipocyte injury but rather by modulation of systemic lipid metabolism. *Lasers Med Sci*. 2017 Feb;32(2):475-479.
56. McRae E, Boris J. Independent evaluation of low-intensity laser therapy at 635 nm for non-invasive body contouring of the waist, hips, and thighs. *Lasers Surg Med*. 2013;45:1-7.
57. Busetto L, Bettini S, Makaronidis J, Roberts CA, Halford JCG, Batterham RL. Mechanisms of weight regain. *Eur J Intern Med*. 2021 Nov;93:3-7.
58. Cohen EK, Bier D, Martinez M. Compliance with U.S. Government Nutrition Advice and Concurrent Obesity Trends Using Nurses' Health Study Data, 1980-2011. *J Nutr*. 2024 Apr;154(4):1356-1367.

Enclosure

Graph 1. Study selection using PRISMA method

