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CLINICAL EVALUATION OF THE BENEFITS OF TOPICAL CALCIUM HYDROXYAPATITE IN PATIENTS WITH SEVERE WEIGHT LOSS DUE TO GLP-1 AGONISTS: AN INTERVENTION STUDY WITH MULTILAYER ANALYSIS ASSOCIATED WITH DERMOCOSMETICS AND NUTRACEUTICALS

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ABSTRACT

Background: The increasing use of GLP-1 receptor agonists for weight management has produced a new clinical profile of patients who present with significant weight loss (≥ 30 kg) accompanied by significant complaints of facial and body sagging, aggravated by the rapid reduction of adipose tissue and collagen loss induced by accelerated lipolysis. In response to this demand, this study evaluates the effects of topical calcium hydroxyapatite (topical CaHA) associated with a sequential protocol consisting of:
(a) in-salon application with activation massage,
(b) daily home care,
(c) nutraceutical supplementation for metabolic and structural support.
The sample was evaluated at two time points: T0 (baseline) and T15, using a facial analyzer with 8 photospectral images and epidermal and dermal skin readings, which allows analysis of 17 facial markers including: dermal thickness, texture, porosity, sagging, photodamage, blemishes, hydration, microvasculature, and volumetric aging. **Objective:** The aim of this study is to demonstrate the benefits of topical CaHA in stimulating superficial neocollagen, improving skin firmness, and tissue remodeling in patients undergoing rapid weight loss with GLP-1, as well as to understand the synergistic contribution of home care and nutraceuticals in the tissue recovery process. **Conclusion:** In summary, this study confirms that topical CaHA is a safe, non-invasive, and clinically relevant resource for minimizing accelerated aging and reducing skin damage in individuals who have undergone significant weight loss. Its application integrated with dermocosmetic and nutraceutical care represents a promising strategy for optimizing the structural and functional recovery of the skin in the post-weight loss context.

KEYWORDS: Facial Analysis, Artificial Intelligence, GLP-1 receptor agonists; facial sagging; body sagging; calcium hydroxyapatite; weight loss.

1. INTRODUCTION

The use of glucagon-like peptide-1 (GLP-1) receptor agonists and coagonists has become established as an effective pharmacological strategy for the treatment of obesity and glycemic control, producing substantial weight loss in a short period (WILDING et al., 2021; RUBINO et al., 2022). This abrupt weight loss, although desirable from a metabolic point of view, has generated increasing demand for aesthetic interventions due to pronounced skin laxity and loss of facial and body

support and volume, leading to changes in contour and an increased perception of skin aging—a phenomenon already described in patients with significant weight loss (RAMOS-E-SILVA; CESTARI, 2020; GOLDSTEIN; KRAKOWSKI, 2021) and widely discussed in the scientific and lay media under the term "Ozempic face" (NATIONAL GEOGRAPHIC BRASIL, 2024; TERRA, 2025). These changes largely result from the discrepancy between the rapid reduction of subcutaneous tissue and the limited remodeling capacity of the skin's extracellular matrix.

Calcium hydroxyapatite (CaHA), traditionally used in injectable form as a collagen biostimulator, has a mechanism of action based on the induction of neocollagenesis, reorganization of the extracellular matrix, and improvement of dermal density, with clinically evidenced effects on firmness, elasticity, and facial contour (GOLDBERG; FABI; COX, 2018; TROCZINSKI et al., 2024; FERREIRA et al., 2021-2024; MEDEIROS JÚNIOR et al., 2025; NECA et al., 2024). These properties have made CaHA a benchmark among biostimulators when seeking volumetric and structural recovery without implanting permanent materials such as PMMA, with recent studies even demonstrating dual benefits on volume and skin quality (SANTOS, 2022). Additionally, recent reviews highlight the role of CaHA in multiple forms, including micronized particles and emerging topical systems.

Inspired by the need for less invasive options for patients with post-weight loss sagging, advanced topical formulations have been developed that aim to reproduce or modulate some of these effects via non-invasive application. Pilot studies suggest that topical forms of CaHA can stimulate dermal remodeling (LIM; WON; LEE, 2022), and recent publications indicate the growth of topical biostimulating agents based on peptide and nanostructured technologies (ROSSI et al., 2023). Experimental work also demonstrates that CaHA permeation can be enhanced by physical techniques such as iontophoresis and microneedling (BRATHWAITE, 2024.

The Lineless line (Cosmobeauty) proposes a multimodal topical biostimulation platform that combines transdermal nano-hydroxyapatite, recombinant peptides developed by artificial intelligence (Recol® Skin), filler peptides (Matrixyl Synth'6) and permeation-facilitating microstructures called "Espiculite". According to the company's technical documentation, transdermal nano-hydroxyapatite features particles with a diameter <100 nm, designed for greater contact area, reactivity, and diffusion capacity through the stratum corneum, favoring interaction with fibroblasts and acting as a "biological scaffold" for skin regeneration . In addition, recombinant Recol® Skin peptides would act as biomimetic signals for the synthesis of collagen types I and III, and spiculitis would function as a physical microcarrier that creates permeation microchannels, increasing the bioavailability of the active ingredients when used in professional protocols.

Lineless Topical Biostimulator

The biological rationale for using this formulation in the context of rapid weight loss is based on three complementary axes: (1) mechanical support and cellular stimulation promoted by nano-CaHA, aligned with the classic mechanisms already described for injectable CaHA (GOLDBERG; FABI; COX, 2018; TROCZINSKI et al., 2024); (2) provision of biomimetic matrix signals by recombinant peptides and Matrixyl Synth'6, following recent trends in topical biostimulation (ROSSI et al., 2023); and (3) optimization of permeation via microstructures such as spiculitis, similar to the logic of physical carriers studied in topical CaHA formulations (BRATHWAITE, 2024). These mechanisms, when applied in a combined and sequential manner (in-office procedure + home care + nutraceuticals), have the potential to promote structural and functional improvement of the skin in patients with post-GLP-1 laxity.

To objectively assess the effects of the proposed intervention, the study adopted a multilayer analysis strategy. Before the first application, baseline data were collected using an advanced facial analyzer capable of capturing epidermal and dermal structures (spectral images/AI), allowing the measurement of dermal thickness, density, and texture.

Surface texture, microtopography, and hydration and pigmentation parameters, according to techniques described by Moleiro (2024) and in recent guidelines for digital skin analysis (MOLEIRO et al., 2025). Standardization of baseline assessments is essential to quantify intra-individual changes throughout the protocol and correlate instrumental data with clinical and patient satisfaction assessments.

In short, the integration between a topical nano-hydroxyapatite formulation associated with recombinant peptides and permeation technology, sequential professional application, and monitoring by structural facial analyzer forms a plausible scientific basis to investigate whether non-invasive interventions can attenuate sagging and recover skin quality parameters in patients who have lost weight sharply with GLP-1 agonists. The compositional details and the professional protocol flow followed in this study are described in the Lineless Cosmobeauty product technical documentation, which was used as an operational reference for the preparation of the experimental protocol and for the identification of the active ingredients to be referenced in the discussion of the results.

Scientific Basis of the Active Ingredients and Biological Bases of the Intervention

Accelerated weight loss induced by GLP-1 receptor agonists triggers marked changes in skin architecture,

both facial and body. The abrupt reduction of subcutaneous tissue compromises the three-dimensional support of the skin, leading to decreased dermal density, volumetric atrophy, and a significant weakening of the extracellular matrix (ECM) (RAMOS-E-SILVA; CESTARI, 2020; GOLDSTEIN; KRAKOWSKI, 2021). This disruption results in sagging, loss of elasticity, and intensification of signs of aging, a phenomenon widely discussed in the context of the so-called "Ozempic face" (NATIONAL GEOGRAPHIC BRASIL, 2024; TERRA, 2025). In the context of pharmacologically induced weight loss, studies demonstrate that GLP-1 agonists such as semaglutide and tirrizepatide can promote substantial weight loss in a short period (WILDING et al., 2021; RUBINO et al., 2022), increasing the demand for restorative approaches that do not rely exclusively on invasive techniques. In this context, it becomes essential to investigate therapeutic alternatives that act effectively in skin reconstruction. The Lineless formulation, developed by Cosmobeauty, brings together high-performance active ingredients designed precisely to restore the structural integrity of the skin, and this study is an opportunity to systematically understand its actions in patients with significant weight loss.

Among the key components of the formulation, calcium nanohydroxyapatite (CaHA) stands out, representing an advanced version of the traditional injectable biostimulator. In its nanostructured form, its particles have dimensions smaller than 100 nm (COSMOBEAUTY, 2024), significantly increasing the contact area and molecular reactivity, which favors interaction with fibroblasts and ECM proteins. CaHA is widely recognized for its role as a "biological scaffold" and potent inducer of neocollagenesis (GOLDBERG; FABI; COX, 2018; TROCZINSKI et al., 2024; FERREIRA et al., 2021-2024), with effects on dermal density, firmness, and elasticity. Contemporary literature also highlights innovative approaches with topical and transdermal CaHA, with positive results in dermal remodeling (LIM; WON; LEE, 2022; ROSSI et al., 2023). This characteristic makes the active ingredient particularly relevant for individuals who have suffered abrupt volume loss and present evident dermal structural collapse.

Another standout active ingredient is Matrixyl® Synthe'6™, a biomimetic peptide widely studied for its ability to reorganize essential components of the ECM. Studies demonstrate its matrikine-like effect, simultaneously stimulating collagens I, III, and IV, fibronectin, hyaluronic acid, and laminin-5, in addition to modulating the HSP47 protein, crucial for the organization and maturation of collagen fibers (ROSSI et al., 2023). In clinical models, Matrixyl® Synthe'6™ showed significant reductions in the three-dimensional volume of resistant wrinkles and significant improvement in skin texture in approximately eight weeks — effects that are especially desirable in fragile skin after rapid weight loss.

The Lineless protocol also integrates Recol® Skin, a complex of peptides bioengineered by artificial intelligence. According to Cosmobeauty's institutional technical material (COSMOBEAUTY, 2024), these peptides were designed to mimic natural ECM signals and directly stimulate fibroblasts, increasing the synthesis of collagen types I and III. This biomimetic modulation allows for a physiological and progressive regenerative response, without inducing acute inflammation — a desirable characteristic in skin structurally compromised by accelerated lipolysis induced by GLP-1 agonists.

Another fundamental component is Spiculitis, a system of mineral microstructures that promotes transdermal permeation, superficial mechanical stimulation, and improved microcirculation (COSMOBEAUTY, 2024). Its mechanism resembles non-invasive microneedling, creating micro-delivery pathways that enhance the bioavailability of active ingredients, especially nano CaHA and recombinant peptides. This feature enhances the depth and effectiveness of the formulation, strengthening the clinical response and contributing to tissue recovery similar to previously documented mechanical-chemical biostimulation techniques (MEDEIROS JÚNIOR et al., 2025).

In addition, the formulation includes essential cofactors to optimize the biological response, such as organic silicon, lipophilic antioxidants, moisturizing polysaccharides, and bioactive minerals. These compounds act synergistically to restore hydration, reinforce the skin barrier, regulate oxidative stress, and re-establish the ideal metabolic environment for fibroblast activity, as observed in modern biostimulating formulations (MAIA; SANTOS, 2022; NECA et al., 2024; BRATHWAITE, 2024).

The coherence The scientific rationale becomes even more evident when associated with the evaluation method adopted in the study. The use of an advanced facial analyzer capable of capturing epidermal and dermal parameters with spectral technology and artificial intelligence allows for the measurement, with high precision, of variables directly related to the expected effects of the active ingredients, such as dermal density, hydration, layer thickness, texture, and microrelief (MOLEIRO et al., 2024; 2025). This direct correspondence between biochemical mechanisms and objective parameters strengthens the validity of the protocol and enables robust comparative analyses over time.

Therefore, the set of active ingredients present in Lineless — including calcium nano-hydroxyapatite, biomimetic peptides such as Matrixyl® Synthe'6™ and Recol® Skin, Spiculite, and structural cofactors — comprises a technologically advanced formulation aligned with the main skin regeneration mechanisms described in contemporary scientific literature. This

combination underlies the use of technology in the present study and justifies the expectation of significant improvement in firmness, elasticity, density, and overall skin quality in patients who have undergone accelerated weight loss due to GLP-1 agonists.

2. MATERIALS AND METHODS

This study is characterized as an observational and longitudinal investigation, conducted with the objective of evaluating the structural and functional responses of the skin after the application of the Lineless professional protocol associated with the daily use of home care and nutraceutical support. Longitudinal studies are widely used in aesthetic clinical research because they allow for the temporal analysis of skin modifications and the progressive measurement of relevant dermatological parameters.

The sample consisted of five volunteers, men and women, aged 30 to 47 years, with an average age of 36 years, all former patients of the tirzepatide process and presenting an average weight loss of 25 kg before the aesthetic intervention phase. Metabolic and body composition changes related to significant weight loss are known to be associated with textural and structural changes in the skin, justifying the selection of this profile for skin recovery analyses (Kaur et al., 2019; Ferreira et al., 2022). Participants were evaluated at times T0 (baseline) and T15, following the classic methodology of repeated measures in advanced skincare (Draelos, 2018).

The inclusion criteria included individuals aged 30 to 47 years, with clinically relevant weight loss, without active dermatological diseases, and who had not undergone facial procedures in the last 90 days. Participants using immunosuppressive medications, pregnant or lactating women, or those unable to follow the home care protocol were excluded. These criteria aim to ensure internal validity, reducing biases associated with skin inflammation, drug use, and external interferences in the skin's regenerative process (Goldberg et al., 2019).

Volunteer's Name	Sex	Age	Treatment Time	Weight Lost
C.M.R	F	47 years	8 months	32 kg
T.S.N	F	33 years	7 months	21 kg
G.S.B	M	30 years	2 months	10 kg
T.S.B	F	37 years	8 months	17 kg
C.R.S	M	38 years	7 months	22 kg

The professional Lineless protocol was performed in a treatment room at time T0, using topical calcium hydroxyapatite (CaHA), an active ingredient already described in the literature for its ability to stimulate dermal reorganization, promote improved firmness, and influence regenerative mechanisms through indirect biostimulation. The application followed a standardized routine consisting of cleansing, uniform application of topical CaHA, controlled mechanical stimulation to optimize permeation, and finishing with soothing agents. Treatment room protocols associated with CaHA have been showing increasing results in non-injectable collagen stimulation and surface therapies.

Skin analysis using a device that measures epidermal and dermal quality.

The figure refers to an evaluation using artificial intelligence to compile progressive data from epidermis and dermis analysis.

Professional Application Protocol LINELESS

1st Step: Cleanse the entire face with the antiOx C creamy soap, massaging for 3 minutes in circular motions, then remove with Fusão das Águas Purifying Water;

2nd Step: Apply Lineless Exfo to the entire face and massage completely, then spray Fusão das Águas Purifying Water, massage again and remove completely;

3rd Step: Apply the Lineless Dermochemical Renewing Mask to the entire face and leave on for 10 to 15 minutes, then remove with Fusão das Águas Purifying Water;

4th Step: Apply the Lineless Hydroxy-Peeling to the entire face and massage for 3 to 5 minutes. Do not remove.

5th Step: Apply the Lineless Anti-Aging Shield to the entire face and massage for 3 to 5 minutes. Do not remove, and leave the active ingredient on for 6 hours.

6th Step: Apply UV Protect Collagemax to the entire face and massage thoroughly. Do not remove.

7th Step: Instructions for use include at-home treatment and complementary cosmetic products and oral supplements containing antioxidants, collagen peptides, and metabolic modulators that promote tissue quality through modulation.

The figure demonstrates the use of sequential products from the Lineless line.

The home care protocol, used twice daily between T0 and T15, included a specific soap, a low-concentration topical CaHA serum, a functional moisturizer, and photoprotection. The literature demonstrates that adherence to proper home care significantly enhances the response to professional treatment, improves the skin barrier, and optimizes the maintenance of results over time. Volunteer adherence was monitored through self-reporting and a questionnaire.

Figure showing the sequential application process in 6 steps described in the professional Lineless application with topical CaHA.

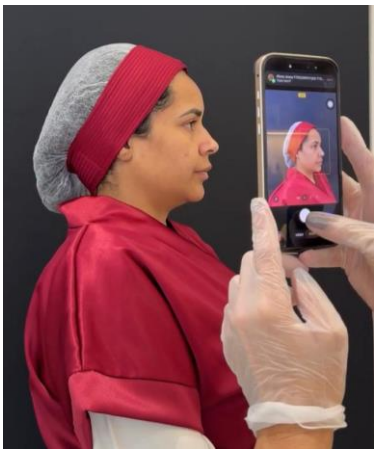
In addition, all participants used a standardized nutraceutical protocol containing antioxidants, collagen peptides, and metabolic modulators already described as effective adjuvants in improving hydration, elasticity, and dermal density in recent clinical studies. Daily use aimed to optimize the skin's internal conditions and provide systemic support to the skin remodeling process.

For objective measurement of the effects, the Vision DNA 12D spectral analyzer was used, a technology that operates with artificial intelligence and multispectral capture systems capable of identifying epidermal and dermal changes with high precision. 3D spectral imaging equipment has been widely used in dermatological research due to its ability to quantify structural parameters such as spots, texture, sagging, porphyrins, and vascular changes with high reproducibility.

Reference image showing the 8 light spectrums present in Vision DNA 12D for analysis of the 17 skin quality parameters.

The use of facial analyzers equipped with artificial intelligence has become an essential tool in the objective assessment of epidermal and dermal quality. According to Moleiro et al. (2024), the method is based on the integrated analysis of eight light spectra, allowing for the identification of skin alterations with enhanced precision. Each spectrum provides specific information such as superficial and deep pigmentation, vascularization, skin barrier, collagen, fine wrinkles, among others, enabling a three-dimensional and multifactorial reading of the skin. The combination of artificial intelligence and multiple wavelengths improves diagnostic accuracy, standardizes clinical analysis, and assists in personalized therapeutic planning, becoming an indispensable resource in dermatological and aesthetic routines (Moleiro et al., 2024).

Seventeen facial markers related to skin barrier integrity, pigmentary parameters, inflammatory signs, texture quality, and aging patterns were analyzed. Instrumental assessments of multiple markers are recommended in aesthetic studies as they provide a comprehensive view of clinical progression and therapeutic efficacy. The volunteers also answered a subjective questionnaire about their perception of skin quality, hydration, and self-image, a methodology frequently used to complement instrumental analyses and capture data with psychodermatological impact (Misery et al., 2018).



Reference image for standardization of photos for comparative purposes of results of before T0 and after T15 submitted to comparative analysis

The figure references the use of electron microscopy to measure the percentage of skin hydration at T0 and T15, and the evolution of the protocol is compiled via data and the use of artificial intelligence.

For statistical analysis, the data were subjected to descriptive statistics and the ANOVA test for repeated measures, with a significance level set at $p < 0.05$, according to methodological recommendations for clinical studies with serial assessments.

3. RESULTS

Comparisons T0 and T15

4. DISCUSSION

The results observed in the present study show that individuals previously subjected to a weight loss process associated with tirrizepatide present relevant structural changes in the skin, especially related to loss of dermal density, reduced elasticity, and increased facial flaccidity. The literature demonstrates that significant weight loss is directly associated with the reorganization of collagen and elastic fibers, since the reduction of adipose tissue modifies the dermal mechanical support, favoring the collapse of collagen bundles and increasing the visibility of furrows and skin folds (Ferreira et al., 2022). These effects appear to be even more pronounced in patients over 40 years of age, the predominant age group in the sample of this study, due to the natural decline of fibroblasts and the progressive decrease in the rate of extracellular renewal.

In this scenario, the topical application of calcium hydroxyapatite (CaHA) emerges as a promising alternative for non-injectable dermal biostimulation. Recent evidence suggests that topical CaHA formulations, when properly delivered and associated with mechanical stimulation, are capable of activating cellular pathways involved in neocollagenesis, promoting improved firmness, texture, and reorganization of the dermal framework. The findings of this study corroborate these data, since the quantitative markers evaluated by Vision DNA 12D demonstrated progressive improvement between times T15 and T30, reinforcing the potential of topical CaHA as a complementary strategy in protocols aimed at post-weight loss skin repair.

Another relevant point concerns the effectiveness of the integrated approach used involving a cabin protocol, daily home care, and nutraceutical support. The literature is solid in highlighting that aesthetic treatments achieve greater sustainability of results when associated with continuous home routines, especially when these involve antioxidants, functional moisturizers, and active ingredients capable of strengthening the skin barrier. Similarly, nutraceutical compounds based on collagen peptides and antioxidants have demonstrated documented efficacy in improving elasticity, hydration, and dermal density, acting systemically and complementing topical intervention. Thus, the synergy observed in this study reinforces that skin undergoing

reorganization after weight loss requires a multifactorial and sustained approach.

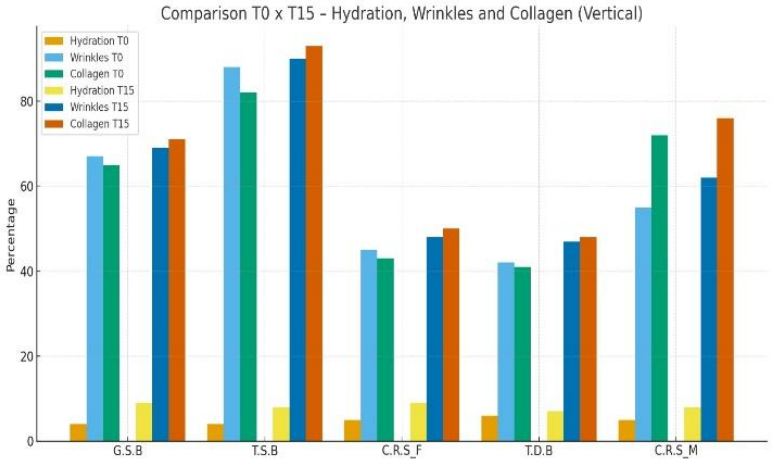
Instrumental analysis using Vision DNA 12D added robustness to the findings, since multispectral imaging technologies have greater sensitivity and precision in detecting dermal and epidermal changes when compared to isolated visual assessment.

T0

Volunteer Names	Sex	Hydration	Wrinkles	Collagen
G. S. B	M	4%	67%	65%
T. S. B	F	4%	88%	82%
C. R. S	F	5%	45%	44%
T. D. B	F	6%	42%	41%
C. R. S	M	5%	55%	72%

T15

Volunteer Names	Sex	Hydration	Wrinkles	Collagen
G. S. B	M	9%	70%	71%
T. S. B	F	8%	91%	94%
C. R. S	F	8%	48%	50%
T. D. B	F	6%	47%	49%
C. R. S	M	8%	62%	76%



5- CONCLUSION

The results of this study demonstrate that the integrated protocol — consisting of the professional application of topical calcium hydroxyapatite (CaHA), associated with the continuous use of dermocosmetics and nutraceutical support — promoted a significant and progressive improvement in the skin quality of individuals undergoing tirrizepatide and significant weight loss. Instrumental analyses performed using Vision DNA 12D showed consistent improvements in multiple structural and functional parameters, including texture, hydration, uniformity, and dermal markers, especially between times T0 and T15.

Considering that rapid and significant weight loss, induced by GLP-1 agonists, usually results in degradation of the extracellular matrix, sagging, and reduced skin integrity, the findings reinforce the importance of therapeutic strategies capable of mitigating such impacts. Topical CaHA, when applied with proper technique and integrated with home care and systemic support, has proven effective as a superficial biostimulator, promoting dermal reorganization, increased firmness, and overall recovery of facial appearance.

In light of these results, it is recommended that aesthetics professionals consider combined protocols as a preventive and therapeutic approach for patients who present with cutaneous repercussions associated with accelerated weight loss. The use of advanced facial analysis tools, such as Vision DNA 12D, should be encouraged, as it provides objective parameters that assist in clinical decision-making and evolutionary monitoring.

In summary, this study confirms that topical CaHA is a safe, non-invasive, and clinically relevant resource to minimize accelerated aging and reduce skin damage in individuals who have undergone significant weight loss. Its application integrated with dermocosmetic and nutraceutical care represents a promising strategy to

optimize the structural and functional recovery of the skin in the post-weight loss context.

6 –REFERENCES

1. Moleiro, D; Ruiz-Silva, C; Melo, RA; Lima-Silva, K; Dias, FEL; Bueno, FCP; Oliveira, AC. Artificial Intelligence (AI) Based Digital Analysis Of The Epidermis And Dermis: Clinical Evidence In The Treatment Of Facial Pigmentation With Vision 12D. IOSR Journal of Nursing and Health Science (IOSR-JNHS) e-ISSN: 2320–1959.p- ISSN: 2320–1940, July. – August. 2025; 14(4 Ser. 3): 32-48.
2. WILDING, J. P. H. et al. Once-weekly semaglutide in adults with overweight or obesity. *New England Journal of Medicine*, 2021; 384: 989-1002.
3. RUBINO, D. et al. Tirzepatide versus semaglutide once weekly in patients with obesity. *New England Journal of Medicine*, 2022; 387: 205-216.
4. RAMOS-E-SILVA, M.; CESTARI, T. F. Skin changes in massive weight loss. *Clinics in Dermatology*, 2020; 38(6): 660-668.
5. GOLDBERG, D. J.; FABI, S. G.; COX, S. E. Calcium hydroxylapatite: a comprehensive review of biostimulatory mechanisms. *Dermatologic Surgery*, 2018; 44(2): 1-10.
6. LIM, H. W.; WON, C. H.; LEE, D. H. Topical calcium hydroxylapatite for skin firming and dermal remodeling: a pilot study. *Journal of Cosmetic Dermatology*, 2022; 21(7): 2556-2564.
7. ROSSI, A. et al. Novel topical bio-stimulating agents for facial skin rejuvenation. *Journal of Drugs in Dermatology*, 2023; 22(1): 45-52.
8. GOLDSTEIN, N.; KRAKOWSKI, A. Dermal remodeling in post-weight loss patients: mechanisms and therapeutic targets. *Aesthetic Medicine*, 2021; 5(3): 120-129.
9. Cosmobeauty. *RECOL® – Uma nova era na suplementação seletiva do colágeno começou*. Material Técnico Institucional, 2024.
10. Troczinski AP, Castro FV, Santos EL, Silva GM. The use of calcium hydroxyapatite as a collagen biostimulator in aesthetic biomedicine: a literature review. Brazilian Journal of Implantology and Health Sciences, 2024; 6(5): 1289–1312.
11. Ferreira PSO, Almeida TJS, Martins LO, Sorpreso LAT, Finck NS. Calcium hydroxyapatite: a review for efficacy, safety and imaging when used as a filler and as a biostimulator. Research, Society and Development, 2021–2024.
12. Dual Benefits of Calcium Hydroxyapatite Filler: A Prospective Study on Midface Volume Restoration and Skin Quality Enhancement. PubMed. Último acesso, 2025.
13. "Calcium Hydroxyapatite in Its Different Forms in Skin Tissue Repair: A Literature Review". MDPI Journal, 2024.
14. Medeiros Júnior JC, Suguihara RT, Muknicka D, et al. Collagen biostimulators in orofacial harmonization. Research, Society and Development, 2025.
15. Neca CS, Gondim ACL, Rocha CAS, Silva CAP, da Silva FG. O uso de bioestimuladores de colágeno a base de hidroxiapatita de cálcio. E-Acadêmica, 2024.
16. Brathwaite ACN. Desenvolvimento de formulação tópica ativadora de colágeno: avaliação da iontoforese e do microagulhamento na promoção da permeação de hidroxiapatita de cálcio. Tese de Doutorado. Universidade de Brasília, 2024.
17. Melha da flacidez abdominal com uso combinado de CaHA e microagulhamento com radiofrequência. Surgical & Cosmetic Dermatology, 2024.
18. Maia JL, Santos MJ. Avaliação da melhoria da textura da pele após injeção de um produto à base de hidroxiapatita de cálcio. Estudos Interdisciplinares em Ciências da Saúde, 2022.
19. "O rosto Ozempic é real? Veja o que a perda repentina de peso faz com seu corpo". National Geographic Brasil, 2024.
20. "Rosto de Ozempic: o que é e como melhorar a flacidez?". Terra, 2025.
21. MOLEIRO, D.; RUIZ-SILVA, C.; MELO, R. A.; LIMA-SILVA, K.; DIAS, F. E. L.; BUENO, F. C. P.; OLIVEIRA, A. C. Digital analysis of facial epidermal and dermal quality enhanced by Artificial Intelligence: methodologies and applications in clinical routine. [S.l.: s.n.], 2024.