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Complementary clinical effects of topical tightening treatment in conjunction with a radiofrequency procedure

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Abstract

Background: Skin laxity and cellulite on the buttocks and thighs are two common cosmetic concerns. Skin tightening with radiofrequency (RF) devices has become increasingly popular. *Objective:* The purpose of this study is to evaluate the efficacy and safety of a topical skin laxity tightening agent when used in combination with an RF device. *Methods:* A double-blinded, randomized clinical trial enrolled twenty females with mild-to-moderate skin laxity on the posterior thighs/buttocks. Each subject underwent two monthly treatments with an RF source (Alma Accent) to both legs. Subjects were then randomized to apply a topical agent (Skinceuticals Body Tightening Concentrate) twice daily to only one designated thigh/buttock throughout the eight-week duration of the study. All subjects were evaluated for improvement in lifting, skin tone, radiance, firmness/tightness, skin texture, and overall appearance based on photographic evaluation by blinded investigators at 12 weeks following the final RF treatment. *Results:* A statistically significant improvement was found in the overall appearance on both sides treated with the RF device when compared to baseline. However, the area treated with the topical agent showed a statistically significantly greater degree of improvement than the side where no topical agent was applied. No adverse effects were reported. *Conclusion:* The use of a novel skin tightening agent used after RF procedures is both safe and effective for treatment of skin laxity on the buttocks and thighs. Combined therapy leads to a better result.

Key Words: *cosmeceuticals, topical agents*

Introduction

Skin laxity is a universal phenomenon of aging that prominently affects the entire body. Minimally invasive skin tightening cosmetic procedures have increased dramatically in recent years, along with an increase in body shaping and skin tightening devices (1,2). As we age, the cellular turnover rate decreases, and the structure of the skin begins to deteriorate. Age-related changes in the skin structure include: increase in the disorderly arrangement of the collagen fiber network (3), decrease in the quantity of fibroblasts, decline in the collagen production by the fibroblasts (4), and increase in the levels of matrix metalloproteinases, the primary enzymes responsible for the degradation of collagen fibers. These damaging events promote atrophy of the dermal layer (5). Skin's biochemical properties degenerate, causing it to become less flexible, and the continuous degradation of the elastin fiber network leads to pronounced skin laxity. Viscoelasticity of the skin is further diminished by a decrease in glycosaminoglycan concentration in the dermal layer (6). Noninvasive radiofrequency-based technologies are increasingly utilized to tighten aging skin.

Recent studies have indicated that radiofrequency bipolar treatment resulted in more youthful skin with better mechanical characteristics, improvements in wrinkles, laxity, skin quality, and appearance (7). Radiofrequency works by generating energy through electric currents, which forces collisions between charged particles. This energy is transformed to the deep cutaneous tissue and heat is created by the tissue's inherent resistance to the movement of ions. When utilized as a body shaping and skin tightening

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procedure, radiofrequency devices cause liquefaction of subcutaneous fat, coagulation of blood vessels, and modifications of the dermal network (8). Because radiofrequency utilizes electric energy instead of photo-energy, the epidermis is largely unaffected, so there are fewer restrictions on using this procedure with diverse skin types (9).

However, radiofrequency devices, when used alone, may not optimally impart all the visible changes desired by the patient, in part because radiofrequency procedures are not targeted to affect the epidermis. Topical compositions specifically formulated to improve the appearance of sagging skin may complement and work synergistically to enhance the clinical benefit provided by the radiofrequency device. The objective of this study was to demonstrate the efficacy and tolerability of a topical tightening treatment containing yeast extract, tripeptide, hydrolized rice protein, microcrystalline cellulose and cellulose gum, and lactic hydroxyacid (LHA) (Skinceuticals Inc, New York) on skin laxity (loose, sagging skin) on the posterior back thigh/buttock after both sides have been treated with FDA-approved radiofrequency device (Alma Accent XL, Buffalo Grove, IL).

Methods and materials

The 8-week, single-center, investigator-blinded study enrolled 20 female subjects, Fitzpatrick skin type of I–III, with mild-to-moderate laxity on the posterior thighs/buttocks. The study protocol and consent forms were approved by the Shulman Institutional Review Board (IRB) in Fort. Lauderdale, FL. Upon completion of the IRB-approved informed consent process, and an evaluation of past medical history, subjects were assessed by the investigator f1or suitability for study entry. Subjects were instructed not to have dramatic weight loss (exceeding 10 pounds during the course of the study) and were monitored. Each subject was assigned to both treatment cells (A, B) and randomized based on which thigh/buttock would receive the application of the topical treatment product. The radiofrequency procedure (Alma Lasers, Buffalo Grove, IL) was performed on the back thigh/buttock region of both legs at baseline and then once again at week 4. Each subject was instructed to apply the test product (Skinceuticals Inc., New York) twice daily to one of the designated posterior thigh/buttock area (cell A) for the duration of the study, while the other thigh/buttock area (cell B) remained untreated with the topical product.

Subject improvement was evaluated at baseline, day 3, week 4, and week 8, utilizing clinical grading along with subjective and objective evaluation of tolerance, and clinical photography. Investigator clinical efficacy assessment included an evaluation of lifting, firmness/tightness, skin tone (evenness), radiance, skin texture, and overall appearance using a 9 point scale (0–4 with half-point increments) and a measurement of thigh circumference. Investigator objective tolerance assessment included an evaluation of erythema, edema, dryness, and peeling on a 5 point scale (0–4). Investigator subjective tolerance assessment included an evaluation of stinging, tingling, itching, and burning on a 5 point scale (0–4). All results were standardized to yield a percentage improvement in each of the aforementioned skin attributes. Subject self-assessment questionnaires were completed at all study time points evaluating the treatment's perceived efficacy, overall skin quality, and product satisfaction.

Digital photographs were taken of both the posterior thigh/buttock areas at baseline (pre-radiofrequency, post-radiofrequency, and post-product application), day 3, week 4 (pre-radiofrequency, post-radiofrequency, and post-product application) and week 8 in order to document all results.

The data collected in the study were evaluated by an intragroup and an intergroup comparison analysis. Intragroup comparison was assessed as an average change from baseline for the individual treatment cell A or B. Intergroup comparison was assessed as the difference in the mean ordinal ratings of each attribute between the two treatments at day 3, week 4, and week 8. These multiple evaluation techniques were utilized in order to properly assess the efficacy of each treatment cell and all differences between the two treatment cells. The level of statistical significance was set at p value ≤ 0.05.

Results

The posterior thigh/buttock area following a radiofrequency procedure and topical treatment (cell A) demonstrated superior clinical improvement when compared to the post-radiofrequency procedure alone (cell B), as exemplified by a statistically significant improvement in all skin attributes at week 4 and week 8. Neither treatment cell achieved a statistically significant improvement in any skin attribute at day 3.

At week 4, cell A attained statistically superior improvement in skin tone (10% vs. 0% $p \leq 0.05$), radiance (17.4% vs. 0% $p \leq 0.05$), and skin texture (18.2% vs. 4.5% $p \leq 0.05$) as compared to cell B. Additionally, cell A attained a statistically significant improvement in overall appearance (12.5% $p \leq 0.05$), while cell B did not achieve a statistically significance result. (Table I) Trend-wise analysis showed superior improvement in lifting (11.5% vs 7.7%) and firmness/tightness (19.2% vs. 15.4%) in cell A as opposed to cell B. Week 4 results for thigh circumference measurement did not attain the required level of significance in either treatment cell.

Table I. Clinical efficacy of skin attributes.

		Radiofrequency + Body tightening treatment (cell A)			Radiofrequency only (Untreated) Cell B			
Assessment	Time Point	Mean (± SD)	Mean % Change from Baseline	*p* Value *from baseline*	Mean (± SD)	Mean % Change from Baseline	*p* Value *from baseline*	P_T *Treated vs. Untreated*
Lifting	Baseline	2.6 ± 0.8			2.6 ± 0.8			
	Day 3	2.5 ± 0.8	− 3.8%	1.000	2.5 ± 0.8	− 3.8%	1.000	1.000
	Week 4	2.3 ± 0.9	− 11.5%	**0.008**	2.4 ± 0.9	− 7.7%	**0.031**	0.500
	Week 8	2.1 ± 0.8	− 19.2%	**< 0.001**	2.1 ± 0.9	− 19.2%	**< 0.001**	0.500
Skin tone (Evenness)	Baseline	2.0 ± 0.4			2.0 ± 0.4			
	Day 3	2.0 ± 0.4	0.0%	1.000	2.0 ± 0.4	0.0%	1.000	1.000
	Week 4	1.8 ± 0.5	− 10.0%	**0.004**	2.0 ± 0.5	0.0%	1.000	**0.004^T**
	Week 8	1.7 ± 0.5	− 15.0%	**0.002**	1.9 ± 0.5	− 5.0%	0.250	**0.008^T**
Radiance	Baseline	2.3 ± 0.5			2.3 ± 0.5			
	Day 3	2.3 ± 0.5	0.0%	1.000	2.3 ± 0.5	0.0%	1.000	1.000
	Week 4	1.9 ± 0.5	− 17.4%	**< 0.001**	2.3 ± 0.5	0.0%	1.000	**< 0.001^T**
	Week 8	1.9 ± 0.6	− 17.4%	**< 0.001**	2.3 ± 0.5	0.0%	0.500	**< 0.001^T**
Firmness/Tightness	Baseline	2.6 ± 0.7			2.6 ± 0.7			
	Day 3	2.5 ± 0.7	− 3.8%	0.500	2.5 ± 0.7	− 3.8%	0.500	1.000
	Week 4	2.1 ± 0.8	− 19.2%	**< 0.001**	2.2 ± 0.7	− 15.4%	**< 0.001**	0.125
	Week 8	2.0 ± 0.8	− 23.1%	**< 0.001**	2.2 ± 0.8	− 15.4%	**< 0.001**	**0.020^T**
Skin texture	Baseline	2.2 ± 0.6			2.2 ± 06			
	Day 3	2.1 ± 0.7	− 4.5%	0.500	2.2 ± 0.6	0.0%	1.000	0.500
	Week 4	1.8 ± 0.6	− 18.2%	**< 0.001**	2.1 ± 0.7	− 4.5%	0.250	**< 0.001^T**
	Week 8	1.7 ± 0.7	− 22.7%	**< 0.001**	2.0 ± 0.7	− 9.1%	0.063	**0.001^T**
Overall appearance	Baseline	2.4 ± 0.7			2.4 ± 0.7			
	Day 3	2.4 ± 0.7	0.0%	1.000	2.4 ± 0.7	0.0%	1.000	1.000
	Week 4	2.1 ± 0.8	− 12.5%	**0.007**	2.3 ± 0.6	− 4.2%	0.125	0.105
	Week 8	2.0 ± 0.7	− 16.7%	**0.001**	2.2 ± 0.7	− 8.3%	0.078	**0.004^T**

Red/Bold indicates statistical significance at $p \leq 0.05$. Blue indicates statistically significant improvement.
^{T}Tightening Treatment (Cell A) performed statistically significantly better than Untreated (Cell B) $p \leq 0.05$.

At week 8, cell A attained statistically superior improvement in skin tone (15% vs. 5% $p \leq 0.05$), radiance (17.4% vs. 0% $p \leq 0.05$), firmness/tightness (23.1% vs. 15.4% $p \leq 0.05$), skin texture (22.7% vs. 9.1% $p \leq 0.05$), and overall appearance (16.7% vs. 8.3% $p \leq 0.05$) as compared to cell B (Table I). Both treatment cells attained statistically significant decline in lifting (19.2% vs. 19.2%) and thigh circumference (1.3% vs. 1.1%) (Table II); however, the improvements were indiscernible between the two treatment cells (Figures 1 and 2).

The topical product application in conjunction with radiofrequency was well tolerated, with no difference in stinging, burning, tingling, and pruritis between the two treatment cells. As expected, objective tolerance assessment revealed an increase in erythema immediately after the radiofrequency procedure, with the increase in erythema attributed to the radiofrequency device. No difference in degree of erythema was noted between the two treatment cells. Additionally, there was no change in edema, dryness, or peeling.

Table II. Thigh circumference measurement.

		Radiofrequency + Body tightening treatment (Cell A)			Radiofrequency only (Untreated) Cell B			
Assessment	Time point	Mean (± SD)	Mean % Change from Baseline	*p* Value *from baseline*	Mean (± SD)	Mean % Change from Baseline	*p* Value *from baseline*	P_T *Treated vs. Untreated*
Thigh circumference(inches)	Baseline	21.5 ± 1.2			21.4 ± 1.2			
	Day 3	21.5 ± 1.2	0.0%	1.000	21.5 ± 1.2	0.5%	0.250	0.313
	Week 4	21.3 ± 1.2	− 0.6%	0.053	21.2 ± 1.1	− 0.7%	0.214	0.905
	Week 8	21.2 ± 1.2	− 1.3%	**0.010**	21.2 ± 1.2	− 1.1%	**0.016**	0.820

Red/Bold indicate statistical significance $p \leq 0.05$. Blue indicates statistically significant improvement.
Negative values indicate an improvement for all attributes.

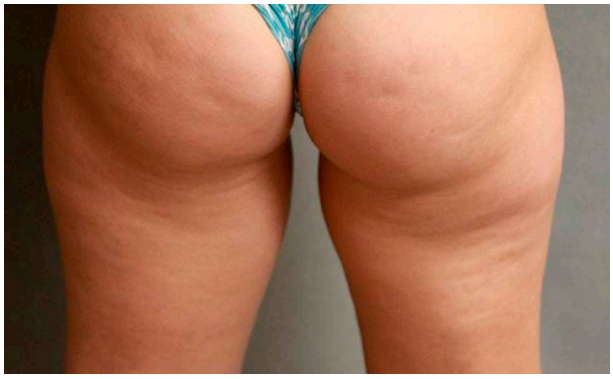

Figure 1. Before radiofrequency and topical agent treatment.

Discussion

In this study, the combination of a topical formulation with the radiofrequency procedure demonstrated significant effectiveness in ameliorating skin laxity and improving the quality of skin. This cosmeceutical composition consisting of tripeptide, hydrolyzed rice protein, and yeast extract was formulated for topical application to various regions of the body. Each ingredient plays an essential role in improving the laxity and overall quality of the skin. Tripeptide molecule is known to stimulate hyaluronic acid synthesis and promote the production of collagen co-factors (10). Hydrolyzed rice protein is known to increase collagen III, collagen VII, and fibronectin in human fibroblasts (11), while yeast extract, derived from *Saccharmoyces cerevisiae*, promotes GAG synthesis and reduces melanin content (12). Collectively, these ingredients work synergistically with the radiofrequency device thereby strengthening the clinical results achieved in the trial. The primary objective of this study was to determine the safety and efficacy of combined modalities of radiofrequency procedure and a novel topical formulation. This study showed that the combined modality delivered substantial clinical benefit and improvement in skin tone, radiance, skin texture, and overall appearance at the conclusion of the study.

Figure 2. 2 months after radiofrequency treatment. Left buttock was also treated with topical agent.

The composition of the skin is not uniform throughout the body. Cutaneous tissue of the body is markedly different from cutaneous tissue of the face and thus requires special consideration when treating with cosmetic devices. Issues like slower recovery time of nonfacial skin may limit the physicians' available treatment options. Unfortunately, even with the recent increase in the number of devices to treat the body, there has not been an accompanying increase in the availability of topical products to be utilized in conjunction with these procedures. This novel topical formulation represents a tangible option for physicians to be used in conjunction with body treatments.

This study utilized a radiofrequency procedure known to promote collagen synthesis and dermal remodeling along with a topical formula containing active ingredients known to stimulate the production of hyaluronic acid, collagen, and glycosaminoglycan. Hypothetically, radiofrequency device treatment may also complement the effect of topical products by enhancing their penetration into the skin layers, allowing optimal proximity to zones of neocollagnesis. Together with the radiofrequency procedure, the treatment composition was able to greatly improve the hallmark signs of skin aging, specifically reducing the severity of skin laxity in the treated area. The data gathered in this study confirmed that topical formulation can enhance the clinical benefit of the radiofrequency procedure.

While radiofrequency is well established as a stand-alone skin tightening procedure, its clinical results were clearly boosted with the use of this new topical formulation. Working in a complementary fashion, the radiofrequency device and the topical formula produced greater improvement in cutaneous laxity than the use of the device alone. By targeting different layers of the skin, these combined modalities are able to offer a more comprehensive solution for patients seeking to improve their aging skin. This study underscores the importance of integrating body devices with topical treatment products as an effective strategy to enhance the aesthetic benefits for the aging patient population (13).

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