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Contents

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Entire book - in print	Modlin J, Jenkins P. *Decision Analysis in Planning for a Polio Outbreak in the United States.* San Francisco, CA: Pediatric Academic Societies; 2004.
Book chapter - in print	Solensky R. Drug allergy: desensitization and treatment of reactions to antibiotics and aspirin. In: Lockey P, ed. *Allergens and Allergen Immunotherapy.* 3rd ed. New York, NY: Marcel Dekker; 2004:585-606.

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Example Article

1. Zoellner J, Krzeski E, Harden S, Cook E, Allen K, Estabrooks PA. Qualitative application of the theory of planned behavior to understand beverage consumption behaviors among adults. J Acad Nutr Diet. 2012;112(11):1774-1784. doi: 10.1016/j.jand.2012.06.368.

In-Text Citation Example

LARGE INCREASES IN AMERICANS' CONSUMPTION OF sugar-sweetened beverages (SSB) have been a topic of concern. Between 1977 and 2002, the intake of "caloric" beverages doubled in the United States, with most recent data showing that children and adults in the United States consume about 172 and 175 kcal daily, respectively, from SSB,[1] it is estimated that SSB account for about 10% of total energy intake in adults[2,3]. High intake of SSB has....

References Section Example

References

1. Duffey KJ. Popkin BM. Shifts in patterns and consumptions of beverages between 1965 and 2002. *Obesity.* 2007:15(11):2739-2747.
2. Nielsen SJ. Popkin BM. Changes in beverage intake between 1977 and 2001. *Am J Prev Med.* 2004;27(3):205-210.
3. Drewnowski A. Bellisle F. Liquid calories, sugar, and body weight. *Am J Clin Nutr.* 2007;85(3):651-661.

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aesthetic medicine

Original Article

Subdermal Induced Heat (S.I.H.) Technology. A new option for skin tightening and fat reduction of double chin

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Abstract

The treatment of the double chin due to submental fat and skin laxity is attracting increasing interest as the potential approaches expand. Recently, mono- and bipolar radiofrequency devices have been introduced as new treatments for skin rejuvenation.

Initial studies have demonstrated changes in collagen content. Subdermal Induced Heat Technology is also known as endodermal Radiofrequency and is one of the most effective uses of this treatment method. We describe a method in patients treated with submental fat due to monopolar radiofrequency treatment. Due to lack of alternative a radio frequency treatment was used. Possible contraindications should be considered and a written Declaration of consent should be received on all possible side effects and risk factors. According to current knowledge, the experience of the doctor with the use of radiofrequency equipment is the most important in determining this result. Therefore, the use of radiofrequency therapy requires extensive training.

Keywords

skin tightening, fat reduction, double chin, radiofrequency, long-term patient satisfaction, Subdermal Induced Heat (S.I.H.) Technology

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Introduction

The demand for minimally invasive or non-invasive treatments in aesthetic medicine is rising rapidly. In particular the demand for minimally invasive treatments for skin rejuvenation as well as moderate fat reduction is in focus. There are currently several platforms (with multiple methods) that have a local skin tightening, fat reduction and more promise. For body contouring and body tightening we have been using different devices for years. We were looking for one effective method to reduce the smallest fat deposits e.g. for the double chin. When selecting the equipment, it was important we avoided costly consumables and be well looked after through service and training in the equipment. However, the effectiveness of the therapies represents the foundation for long-term patient satisfaction, a success factor that should not be underestimated. Therefore, we report on a treatment system that covers both indications and is also versatile, so the user has a variable tool available[1,2].
Non-invasive radiofrequency (RF) is one of the commonly used procedures, especially for the treatment of skin laxity[3]. This therapeutic method is conditioned by a selective and controlled increase in tissue temperature of high frequency. The temperature and depth of heating depend on the level of energy used and on the impedance of the biological tissues[4]. The aim is to induce thermal damage to stimulate changes in collagen composition and to produce collagen neogenesis in deep layers of skin and subcutaneous tissue[5-7].

Anatomy of double chin - submental fat

A double chin is a layer of subcutaneous fat (submental fat) around the neck that sags down and creates a wrinkle, creating the appearance of a second chin.
Looking at the submental region the deep layers are formed by muscle and fascia, and a subcutaneous layer of fat lies over these deep structures. This superficial layer of fat is divided by the platysma, a caudal continuation of the superficial muscular aponeurotic system (SMAS) (*Figure 1*).
The borders of the compartments are formed by fascial septae that travel from the deep fascia or periosteum and insert into the dermis. These compartments provide a new method of viewing the aging face and neck as resulting from variable changes in volume and position in the various compartments (*Figure 2*).
The submental fat compartment plays an important role in the appearance of the youthful and aesthetic neck, as well as in the overall attractiveness of the face. Bitner et al developed a classification scheme for assessing the degree of "turkey gobbler" deformity in the submental region based on changes with the skin, fat, platysma, and underlying bone. This classification method serves as an invaluable tool in evaluation and subsequent intervention[8-10].

Figure 1 *- Frontal view on preplatysma fat*

Figure 2 *- Sideview on preplatysma fat*

Subdermal Induced Heat (S.I.H.) Technology - endodermal Radiofrequency Physical basics

The treatment with the S.I.H.T System is technically a monopolar, controlled heating of tissue layers of different depths with high-frequency current, whose voltage, current intensity and frequency modulation can be regulated depending on the application via a clear platform and monitoring with a thermal camera. It is equipped with an external plaque, which is far from the treatment area in skin contact. S.I.H.T System or RF, generally indicates an electric signal or a high frequency electromagnetic wave which propagates in space or in a coaxial cable. The system is related to radio frequency or high-frequency devices. By choosing the depth of treatment, either the dermis or the subcutaneous fatty tissue can be treated. The effects in these different tissues are very different. In the treated fat layers, apoptosis is induced, i.e. the medium-term degradation of fat cells. On the other hand, the system in the dermis has an effect on the function of cellular activity as well as on the extracellular matrix in order to tighten up by restructuring collagenous fibers and stimulating the fibroblasts. In contrast to other devices, the heat does not occur through all skin layers but from below directly at the dermis. In this way, no heat loss occurs at the destination (treatment point) because the probe applies the desired temperature to the target location[11,12].
RF treatments for skin tightening are common, as they heat the dermis and subcutaneous tissues, thereby stimulating dermal collagen remodeling. It is well documented that dermal heating induces an immediate change in collagen structure followed by a long-term stimulation of neocollagenesis[13]. These thermal effects can improve wrinkle appearance, skin laxity and contour of both face and body[14].

Application

Patients with acute or chronic skin pathologies (e.g. impetigo, lymphadenopathy, pharyngitis) or direct involvement in or around the skin area to be treated were excluded. Pregnancy, lactation, heart pacemaker or step maker of any kind and dermal filler treatment (in or around the area to be treated) less than 3 months earlier were also excluded criteria.
A total number of 20 patients were treated. Female (14) and male (6) patients between the ages of 22 and 60 were treated. The selected patients did not have any dermal filler injection in their medical history in the treatment area. Two patients reported on pre-treatment with injection lipolysis at the target area.
Before treatment, it is recommended using a local disinfection and also applying a local anesthetic injection in the area of the entry point of the probe. Topical anesthesia cream, nerve block or tumescent anesthesia are not necessary in such a therapy. However, it can be used for a better patient comfort. The insertion of the probe itself is almost painless. This is a single- use manipol. Only the point of entry could be painful, so local anesthesia is necessary. One should try to make the treatment as painless as possible for the patient. Only

Figure 3 *- Left: before treatment; Right: 8 weeks after treatment*

Figure 4 *- Left: before treatment; Right: 8 weeks after treatment*

Figure 5 *- Left: before treatment; Right: 8 weeks after treatment*

the heat in the tissue leads to a (uncomforting) burning sensation. This burning sensation cannot be prevented by means of larger amounts of anesthetic. The treatment schedule was 3 cycles of 120 sec. each side with a treatment temperature of 70° Celsius.
A direct reintegration into social life is easily possible due the fast convalescence. For example, the treatment can also take place during lunch break or before important events, and patients can return to work or participate in events after the treatment on the same day.
An additional benefit is the use for patients who have previously demonstrated intolerance, incompatibility to any other ingredients of products or patients who did not succeed in other therapies.
The only adverse events described were hematoma, redness, bruising, tingling, burn sensation and swelling. All adverse events lasted for a maximum of 5 days (Table III). The double chin thickness was determined using the skinfold calipers. The sense of satisfaction by the patients was evaluated with the use of a subjective analog scale from 1 to 10. The mean score of satisfaction of cosmetic result was 7-9 four weeks after treatment and 9 - 10 eight weeks after treatment, and the score remained relatively stable even after a few months (*Table 1*). Only an immediate result will not be visible. The treatment was very well tolerated with only a few mild adverse reactions. Only a burning sensation was reported as a major side effect. However, this was well tolerated by all patients. The minimal side effects like erythema or bruising resolved spontaneously after a few days only. No major complications (e.g. infectious processes, necrosis, embolism, overcorrection, allergies) were observed.

Conclusion

Subdermal Induced Heat (S.I.H.) Technology is a safe, low-risk, easily applicable therapy option for practitioners and provides a particularly good alternative method for skin tightening and fat reduction. Especially for the submental area, it provides a very good option for treating the double chin.
The local treatment with endodermal radiofrequency (S.I.H.T.) shows through clinical studies and analysis a high safety and efficiency. This innovative treatment is characterized by its high tolerability. Thus, a realistic satisfaction of the patient expectation can be achieved, with an excellent visible effect.

Immediately after treatment	--
1 month	7-9
2 months	9-10
4 months	8-9
6 months	6-8

Table 1 *- Score of satisfaction of patients*

Skin laxity
Smoothing of fine lines
Fat elimination of smaller fat deposits Skin tightening
Correction of scars
Body-contouring
Double-chin correction

Table 2 *- Esthetic indications for S.I.H.Technology*

CLINICAL ASSESSMENT POST-TREATMENT				
	During treatment	Immediate post-treatment	2-Week follow-up	4-Week follow-up
Erythema	17	17	0	0
Pain / Burn sensation	20	1	0	0
Tingling	8	5	0	0
Swelling	0	1	0	0
Bruising	2	2	0	0
Blanching	0	1	0	0
Combustion	0	0	0	0
Numbness	0	0	0	0

Table 3 *- Clinical assessment observed after treatment*

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Original Article

Use of Helmet with Combined Low-Level Laser Therapy, Light- Emitting Diodes, and Magnetic Field Technologies for Hair Growth Treatments of Male Androgenic Alopecia in Adult Patients

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Short title: Combined Technologies for AGA

Abstract

Background: androgenetic alopecia affects up to 50% of men and women.
Aim: This study aimed to evaluate the use of a treatment combining low-level laser therapy, light-emitting diodes and magnetic field technologies for the improvement of hair loss associated with male AGA in the scalp area.
Methods: the study included healthy men aged 25-45 who had self-perceived thinning hair and reported active hair loss within the previous 12 months. Men who had received physical or chemical aesthetic treatments for hair loss were excluded. All patients received 12 treatment sessions (one per week) with Miltahead®, a noninvasive therapeutic helmet combining these three technologies, and were re-evaluated six months after the last treatment session.
Results: a total of 10 men with a median age of 35.4 years (SD 5.4; range of 28-44 years) were enrolled and completed the study. At 6 months of treatment, terminal hair density had a mean increase of 40.0% (SD 25.1), hair density of 30.2% (SD 14.7), quantity of hairs of 30.2% (SD 14.7), cumulative hair thickness of 37.8% (SD 24.3), number of follicular units of 24.7% (SD 15.3), follicular unit density of 24.8% (SD 15.4), and vellus hair density had a decrease of 3.3% (SD 83.1). The treatment was safe, and no adverse effects were reported.
Conclusions: the combined use of these three technologies for AGA treatment in men provided excellent results for hair growth compared with other studies. However, additional research is needed.

Keywords

Androgenic alopecia, low-level laser therapy, light-emitting diodes phototherapy, magnetic fields, hair growth.

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Introduction

Androgenetic alopecia (AGA) is a polygenic disorder involving both maternal and paternal genes, with variable penetrance and familial predisposition determined by genetic and environmental factors[1]. It is characterized by an excessive response to androgens and affects up to 50% of men and women, with a distinctive distribution by gender[2].In males, hair loss is most prominent in the vertex and the frontotemporal regions[3]. The prevalence in 50-year-old Caucasian males is of 50%, reaching around 80% in 70-year-old male[4]. Its molecular pathophysiology consists of dysregulation of signaling pathways and inappropriate immune and inflammatory responses[5].

There are two FDA-approved drugs for the treatment of AGA: topical minoxidil and finasteride, both requiring four to six months before noticing an improvement, and which must be used indefinitely to maintain a response. New techniques have made hair transplant more effective, cosmetically pleasing, and natural- looking; however, patients need to have more than 40 follicular units/cm2 to cover the bald area[6]. Both Red light and laser at 660 nm have also demonstrated efficacy for hair loss, and the use of low-level laser therapy (LLLT), as well as of phototherapy with light-emitting diodes (LEDs),[9] has been intensified to promote hair growth in AGA[7,8].

For years, LED phototherapy has been presented as an effective and safe tool for the treatment of skin, mucous and scalp conditions in which there is an inflammatory component, being used successfully in the treatment of acne[10], vaginal atrophy[11], facial aging[12,13], and also in disorders related to hair growth[14,15]. The innovative combination of LLLT, LEDs, and magnetic field technologies for the treatment of AGA is of recent development. Synergy of emissions, including visible spectrum, infrared, soft laser, and magnetic field, helps to densify the hair by activating the cellular metabolism of hair follicles and improving the quality and density of the existing hair.

This study aimed to evaluate the use of combined LLT, LED, and magnetic field technologies for the improvement of hair loss associated with male AGA in the scalp area.

Methods

Study Design

The study was conducted in the Elite Laser Clinic and Clínica MC360 as a proof-of-concept, open-label, prospective trial. A treatment period of three months from the first treatment of the first patient to completion of the last treatment of the last patient was estimated. The participation period for each subject was nine months, including the screening/baseline/first treatment visit up to the 12th treatment visit and a follow-up visit at six months. The complete treatment course included 12 treatment sessions conducted once per week for 12 weeks. Patients were re-evaluated six months after the last treatment session. The study was conducted following the principles outlined in the current revised version of the Declaration of Helsinki, Good Clinical Practice (GCP) and in compliance with all applicable laws and regulatory requirements relevant to the use of devices in Spain. All patients signed an informed consent form to participate in the study before starting any procedure.

Subjects

This study included males aged between 18 and 55 with AGA. Additional inclusion criteria were: 1) healthy men aged 25-45 who had self-perceived thinning hair and reported active hair loss within the previous 12 months (however, the diagnosis of AGA was confirmed by the investigator to ensure that the patient met the inclusion criteria.); 2) presentation of male pattern hair loss/androgenic alopecia in the temples, and the vertex and mid-frontal scalp (Norwood[2-4]); 3) and willingness to correct their condition and ability to comply with all requirements of the protocol. Exclusion criteria were to have received physical or chemical aesthetic treatments in the target area within six months before study enrollment, and to have taken or plan to take topical or systemic medications for the treatment of hair loss and/or hair volume.

Interventions

Consecutive men diagnosed with AGA were invited to participate and, after confirming their eligibility and signing the corresponding informed consent, they were included in the study. Patients underwent a treatment of 12 sessions with Miltahead® (Milta Technologie, Mudaison, France), a non-invasive therapeutic helmet that combines LLLT, LEDs and magnetic field technologies (*Figure 1*). Technical characteristics of the device were: 1) Nano-Pulsed Cold Laser (NPCL) Laser Emission in Coherent Infrared Light at 905 nanometers, 2) non-coherent emission pulsed by trichromatic diodes RGB CMS (400 to 650 nm), 3) non-coherent continuous pulsed infrared emitting by monochromatic diode at 905 nanometers, 4) constant circular magnetic field (70 milliTesla) equivalent to the Earth's magnetic field, and 5) potentiation of light radiation thanks to the magnetic field. Each session lasted between 20 and 25 minutes.

Figure 1 *- Miltahead® device (Milta Technologie, Mudaison, France).*

Before the first treatment, the target area was shaved, and the baseline assessment was performed. To homogenize the study area, the zone to treat was measured from the birth of the right ear to that of the left ear, placing the tape measure as a headband, and marking the intermediate point as a reference.After this first measurement, on this point was placed a template and with the help of a hook, a lock of hair was extracted that was subsequently shaved. The length of the shaved hair was not be more than 0.3mm (this information was verified with the TRICOSCALE®). A second measurement was performed from the shaved point towards the occipital area to know the exact point that was to be shaved 30 days later. The photos were taken 48 hours after this procedure. In case of gray or blond hair, the area was dyed with a drop of beard dye and a drop of hydrogen peroxide for 12-15 minutes. After that, the area was cleaned with hydrogen peroxide to ensure that the scalp had no traces of dye left before taking pictures. The first photo was taken as MACRO, and after marking the exact point where it was taken, the next photo was taken as MICRO at 20%.

Efficacy Outcomes

The primary efficacy outcome was quantitative hair growth, measured as terminal hair density in the treated area. A quantitative evaluation was conducted per total treated area and per group of hair follicles corresponding to the treated area.

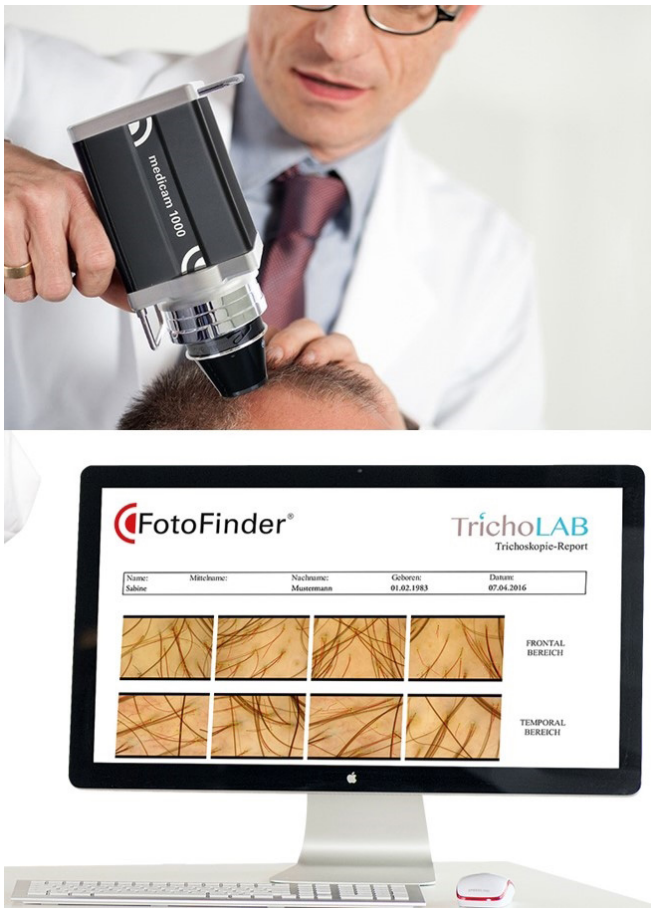

Figure 2 *- Quantitative hair growth by dermatoscopic imaging (FotoFinder Trichoscale Pro System; FotoFinder Systems GmbH, Bad Birnbach, Germany).*

Quantitative hair growth in the treated area was assessed by dermatoscopic imaging (FotoFinder Trichoscale Pro System; FotoFinder Systems GmbH, Bad Birnbach, Germany) at baseline and at the follow-up visit (six months after the last treatment session) (*Figure 2*).
Other outcome measures assessed in the treated area before and after treatment were: 1) number of hair, 2) hair density (number of hairs per cm2), 3) vellus hair density (number of hair per cm2), 4) cumulative hair thickness (mm per cm2), 5) number of follicular units, and 6) follicular units density (number of follicles per cm2) (*Figure 3*).
Treatment safety was assessed by recording all procedure complications and any adverse events that may have occurred during treatment and until the follow-up visit.

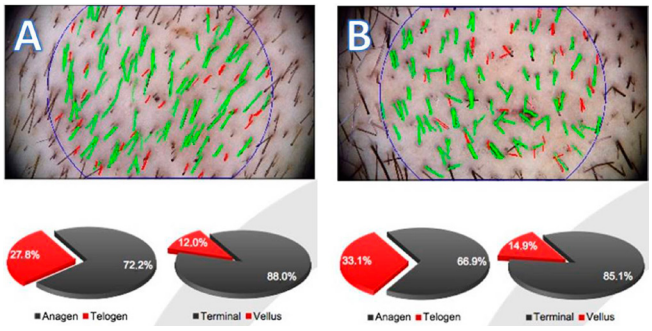

Figure 3 *- Visualization of clinical measurements with Trichoscale Pro System in a study patient before (A) and after 6 months of treatment (B).*

Statistical Analysis

Statistical analysis was limited to the description of study variables, and no hypothesis tests were performed. Quantitative variables were described as the mean and standard deviation (SD), whereas categorical variables were described as frequency and/or percentage. Efficacy outcomes were assessed as the change of the corresponding variable from time 0 (i.e., baseline) to 6 months (i.e., follow-up visit).

Results

Subject Characteristics

A total of 10 males with a median age of 35.4 years (SD 5.4; range of 28-44 years) were enrolled in the study site. All of them completed the study.

Efficacy Outcomes

Table 1 summarizes changes in terminal hair density (primary outcome) from baseline to six months of treatment. Terminal hair density of all patients had a mean increase of 40.0% (SD 25.1) (*Table 1*) (*Figure 4*).
Secondary effectiveness endpoints included subjects' assessment of overall hair growth (Table 1). For all hair parameters, the differences between values at baseline and after six months were calculated. After six months, hair density (*Figure 5*) had a mean increase of 30.2% (SD 14.7), quantity of hair of 30.2% (SD 14.7), cumulative hair thickness (*Figure 2*) of 37.8% (SD 24.3), number of follicular units of 24.7% (SD 15.3), follicular units density of 24.8% (SD 15.4), and vellus hair density had a decrease

Variables assessed	Baseline (N=10)		Six months of treatment (N=10)		Difference		% of increase	
	Median	SD	Median	SD	Median	SD	Median	SD
Primary efficacy outcome								
Terminal hair density (1/cm2)	78.2	29.1	104.5	27.6	26.4	14.0	40.0	25.1
Secondary efficacy outcome								
Quantity of hair	88.2	36.0	110.7	35.8	22.5	3.0	30.2	14.7
Cumulative hair thickness (mm)	6.0	2.0	8,1	2.4	2.1	1.2	37.8	24.3
Hair density (n/cm2)	97.6	39.9	122.6	39.7	24.9	3.4	30.2	14.7
Vellus hair density (n/cm2)	12.6	12.0	9.7	7.2	-2.8	10.0	-3.3	83.1
Follicular units	63.4	18.4	77.1	16.5	13,7	7.5	24.7	15.3
Follicular unit density (n/cm2)	70.2	20.4	85.4	18.3	15,2	8.4	24.8	15.4

Abbreviations: N, number of patients; SD, standard deviation; n, number; cm, centimeters; mm, millimeters

Table 1 *- Results of variables assessed at baseline and at 6 months of treatment.*

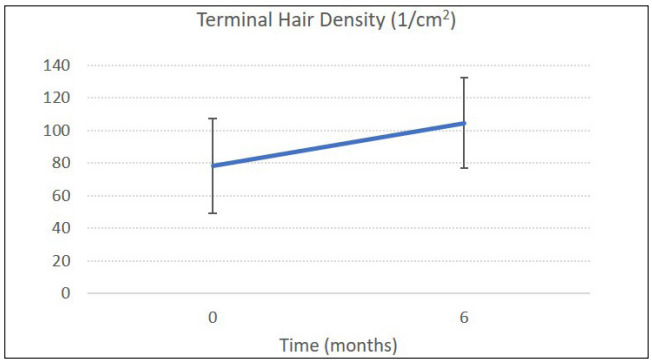

Figure 4 *- Terminal hair density at baseline and at 6 months of treatment (N=10).*

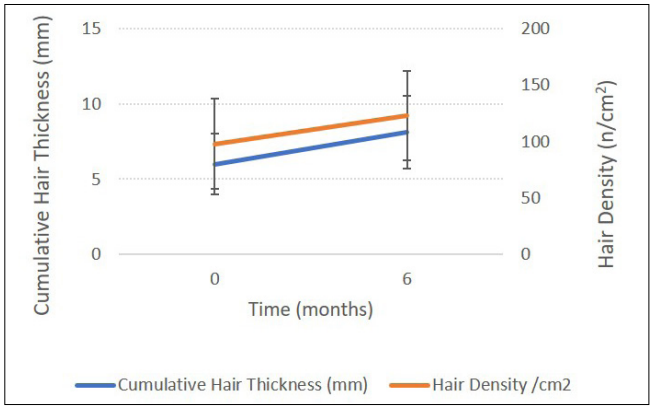

Figure5 *- Cumulative hair thickness and hair density at baseline and at 6 months of treatment (N=10).*

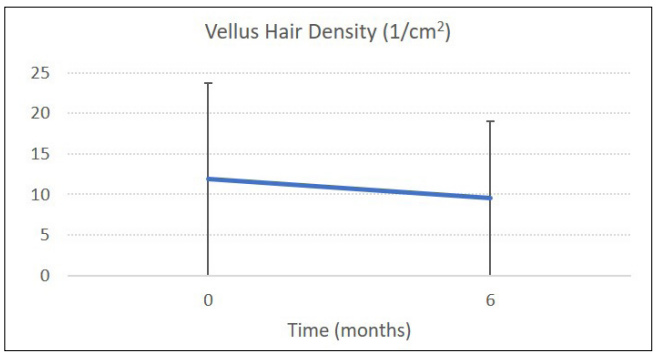

Figure 6 *- Vellus hair density at baseline and at 6 months of treatment (N=10).*

of 3.3% (SD 83.1). Regarding vellus hair density, after six months of treatment it was observed that it had increased in three (30%) patients , it had decreased in six (60%) patients, and there were no changes in one (10%) patient (*Figure 6*).

Safety Outcomes

The procedure did not require analgesia/anesthesia. Patients did not report pain during the treatment, and no complications or side effects were reported.

Discussion

The results of the study showed a considerable increase in the values of the primary outcome. Mean increase of terminal hair density was 40%, as well as the rest of the variables (23% to 30%), except for vellus hair density, which decreased by 1.7%.

Some studies had investigated a variety of light sources and treatment parameters for the management of alopecia, such as LLLT,[16–21] various wavelengths of LED light[14,15,22,23] and several techniques combined, such as LED-LLLT [9,12,14,15,19,24]. The device used in this study is a technological innovation that combines, in a synergistic way, Nano Pulsed Cold Laser (NPCL) laser emitters, infrared diodes and RGB diodes in a magnetic tunnel. The synergy of these energies (magnetic field, infrared, laser) allows thanks to the scattering of photons up to 13 cm in soft tissues to act directly on the hair bulb to lengthen the hair growth (anagen phase). This effect promotes the stimulation of stem cells, increasing vascularization of hair bulbs and activating the stem cells of the dermal papilla, which improves the oxygenation of the capillary bulb and the metabolism of cells[25–26].

Although the available literature regarding phototherapy-based devices to treat AGA is limited, study results regarding the primary outcome showed a better performance than those reported in previous studies.

Leavitt et al. (2009) conducted a 26-week, randomized, double-blind, sham device- controlled, multicenter trial in which 110 males with Norwood-Hamilton classes IIa–V AGA were randomized for treatment with either the HairMax LaserComb® or the sham device (2:1)[24].

The primary efficacy endpoint was mean terminal hair density. At 26 weeks, this variable had an average percentage of increase of 19.8% in treated patients, 50.5% lower than the result obtained in our study, which was of 40.0%.
Kim et al. (2013) performed a randomized, double-blind, sham device-controlled trial at two research centers that included 40 male and female subjects with AGA treated with a helmet- type 3R LLLT device with a light source consisting of light-emitting diodes (LEDs) emitting wavelengths of 630 nm (3.5 mW, 24 units, L-513ECA) and 660 nm (2.5 mW, 18 units, L- 513LRC) and laser diodes (LDs) with wavelengths of 650 nm (4 mW, 27 units, DL3147– 060). [17] The primary endpoint was change in hair density in the target area between baseline and after 24 weeks of treatment as measured with a phototrichogram. Six months after the last procedure, the average percentage of increase in hair density was of 14.7%, 51.3% lower than the result obtained in our study, which was of 30.2%.
Finally, Suchonwanit et al. (2018) conducted a 24-week, prospective, randomized, double- blind, sham device-controlled clinical trial that included male subjects aged over 18 years with AGA treated with RAMACAP, a combat helmet-shaped device containing single-mode laser diodes, which emit at a wavelength of 660±10 nm.[8] The primary efficacy endpoint was change in hair density and diameter of the target area of the scalp from baseline and at weeks 8, 16, and 24, by photographing the target area with a Folliscope® and measuring it with Folliscope 2.8 software (LeadM Corporation, Seoul, Korea). Six months after treatment, the average percentage of increase in hair density was of 9.1%, 69.9% lower than the result obtained in our study, which was of 30.2%.
Despite the higher increase in terminal hair density observed in this study, our results should be assessed in the context of the limitations of the study design. Thus, unlike other studies mentioned previously[8,17,24],our study was not randomized and did not compare the efficacy of the investigation device with that of a sham device. Furthermore, the low number of patients did not allow to assess any statistical significance using hypothesis tests. We did not perform a split-scalp study since there are published studies that describe that when acting with LLLT in one part of the scalp the benefits on the treated area may affect the untreated area, distorting the results of the study. The treatment was safe, and no adverse effects were reported. All patients could take up their usual activities at the end of each session.

Conclusion

In summary, the combined use of NPCL laser emitters, infrared diodes and RGB diodes in a magnetic tunnel for the treatment of AGA in men provided excellent results for hair growth. However, future randomized, double-blind studies with sham devices and a more significant number of patients will be necessary to confirm these results.

Potential conflicts of interest

The authors declare no conflicts of interests.

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Review

Carboxytherapy for the Treatment of Localized Fat in Abdomen and Thighs: a Systematic Review and Meta-Analysis

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Short title: Carboxitherapy for Localized Fat

Abstract

Background: Carboxytherapy is a frequent procedure in aesthetic medicine to reduce adipose tissue; due to its minor adverse effects and its easy application technique.
Aim: To carry out the first comprehensive systematic review and meta-analysis of studies to evaluate the effect of carboxitherapy for the treatment of localized adiposities.
Materials and Methods: A systematic review was carried out in PubMed, Embase, Web of Science and Cochrane for eligible studies from 01/01/2000 until (05/31/2018) to identify clinical studies that evaluated the effect of carboxytherapy for the treatment of localized adiposities. A meta-analysis was performed to produce estimates grouped by fixed-effect models.
Results: The primary literature search produced 285 articles. After the application of inclusion criteria, six studies were selected for review. For the thigh contour, 139 women noticed a significant reduction of 1.92 cm (95% CI 0.90-2.95, p <0.001). For the abdominal circumference, 156 patients (140 women and 16 men), noticed a significant reduction of 2.15 cm (95% CI: 0.45-3.85, p = 0.01). For the thighs, a significant increase in the reducing effect was observed: in the group of patients who injected <500 cc CO2 per session, six or more sessions were performed with a frequency of 1 session per week at an infusion rate of ≤50cc / minute. For the abdominal perimeter, a greater effect was found in the group that received two weekly sessions.
Conclusion: The available evidence demonstrates that carboxytherapy is an effective procedure for the significant reduction of the contour of the thighs and the abdominal circumference in patients with adiposities located in these areas.

Keywords

Cellulite, Subcutaneous Fat, Intradermal Injections, Local Adiposity, Carbon Dioxide therapy

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Introduction

In recent years, new technologies have been developed to address the contour of the body in a less invasive way. These therapies are aimed at the selective destruction of fat, in addition to the ability they have to improve efficiency with a shorter recovery time and to minimize adverse events.

The Carboxytherapy refers to the intradermal or subcutaneous use of medicinal carbon dioxide (CO2) for therapeutic purposes[1]. Historically, this therapy originated in France in 1932, at the Royat Thermal Spa (Clermont-Ferrand), for the treatment of patients by through the elimination of arteriopathies (Arteriosclerosis, Buerger, Reynaud, etc.), in which an increase in the femoral blood flow and an increase in partial pressure of oxygen in the lower extremities are observed[2,3], which shows a vasomotor effect. The administration of CO2 shown its success in improving the parameters of the circulation and tissue perfusion, but there is also a partial increase in tcPO2 (Transcutaneous Oxygen Tension)[4]. This effect may be due to an increase induced by hypercapnia in capillary blood flow, a drop in cutaneous oxygen consumption, or a deviation to the right of the O2 dissociation curve (Bohr effect)[5].

Carboxytherapy improves the microcirculation in tissues that are treated through the application of two proposed mechanisms: vasodilation and induction of angiogenesis and neovascularization. It has been shown that carbon dioxide therapy induces the local synthesis of endothelial vascular growth factor, resulting in nitric oxide-dependent neoangiogenesis[6]. The reducing effect on the adipose tissue can be divided into the fracture of the adipocyte membrane releasing triglycerides in the extracellular matrix as proposed by Brandi2 secondary to a direct mechanical effect as proposed by Balik et al.,[7] and a lipolytic effect secondary to the stimulation of the adipocyte β receptors due to the stimulation of the receptors of the dermis[8] and the sympathetic fibers that release Noradrenaline as the main driver of lipolysis in adipose tissues. the activation of ADRB3, which is signaled through the Gs-adenylyl cyclase-cAMP-PKA pathway[9].

The reduction of adipose tissue was confirmed with computerized cytometry, measuring the histological and morphological changes of the adipocytes[10] and diagnostic ultrasound before and after treatment of localized adiposities with Carboxytherapy[11]; it was found that the standardized infusion of CO2 in the subcutaneous tissue reduces significantly the number and size of adipocyte[10] and thus the thickness of adipose tissue11. Recently, adipose vasculature and associated factors such as VEGFA (Vascular Endothelial Growth Factor A) and FGF[1] (Fibroblast Growth Factor) have been recognized as important regulators in the remodeling of adipose tissue. Park et al[12], in their results, evidence was found that the adipose tissue vasculature is associated with carboxytherapy induced-adipose tissue reduction. In addition to these effects on microvascularization and adipose tissue, Carboxytherapy has effects on the connective tissue[13], stimulates the synthesis of collagen and improves the appearance of the skin, resulting in a thicker appearance of the dermis, with collagen fibers distributed more diffusely[2,14] improving the texture and tone of the skin, which makes it also useful in the treatment of cellulite [1,15]. The elimination of fatty tissue lines and a 12.6 mm decrease in the adipose panniculus11 have been demonstrated, as well as a significant reduction of the cellulitis of the grade III to grade II[1,15].

Carboxytherapy is considered a generally safe procedure. The adverse effects reported are minor: erythema, bruising, swelling, emphysema and pain at the site of the injection, with pain being the most frequent[16]. Two cases of massive subcutaneous emphysema have been reported in two women without complications or secondary effects[17,18].

To date, no cases of embolism have been reported in the literature after subcutaneous application of CO2 for aesthetic purposes. However, if there are cases of embolism in laparoscopic surgical procedures[19–22] and endoscopy[23], the risk of embolism may be related to the infusion rate, the caliber of the vessel and the amount of gas injected[24].

The evidence available to date, related to the effectiveness of carboxytherapy in the treatment of localized adiposities (body contour) is reduced. Studies published in the last two decades have great limitations such as small sample sizes, significant risk of biases, and contradictory or inconclusive results. The above, motivates the group of authors to generate a Systematic Review - Meta Analysis that condense the published results and contribute to the current state of knowledge on this particular topic.

Materials and methods

Study design

We have developed a Systematic Review and Meta-Analysis following the reference items of the PRISMA Statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyzes: The Prisma Statement)[25].

Inclusion Criteria

Studies with the following characteristics have been included: Quasi-experimental Type Before and After designs and Randomized Clinical Trials, adult population (≥18 years) of both sexes. Date of publication from 01/01/2000 until (05/31/2018), pre- and post-intervention measurement expressed in centimeters of the abdominal circumference and the contour of the thigh. Follow-up of patients for at least 4 weeks.

Search Strategy

The systematic literature research was carried out in Databases: PubMed, and later in OVID Medline, Embase, Scopus, and Web of Science. The research began on April 1, 2018 and ended June 1, 2018. For the systematic research of literature in the Electronic Databases, we have conceived the following search algorithm: (((Cellulite OR Localized Adiposities OR Adiposity [MeSH Terms] OR Subcutaneous Fat [MeSH Terms] OR subcutaneous adipocytes OR Abdominal Fat)) AND (Carboxytherapy OR carbon dioxide [MeSH Terms] OR carbon dioxide therapy OR Localized lipolysis OR

subcutaneous infiltration OR CO2 infiltration OR CO2 infusion OR Subcutaneous Injections [MeSH Terms])) AND ("2000/01/01" [Date - Publication]: "2018/05/31" [Date - Publication]) NOT animals.

Article Selection and Data Extraction

The articles selected by the inclusion criteria were subject to a complete review by the researchers. Additional articles were identified by a manual review of the references of the articles that were initially found in the primary search. Surveys and studies on animals were eliminated. From the studies obtained, a critical reading of the complete text was made, studies that did not meet the selection criteria were excluded and the remaining studies subjected to quantitative analysis.
In all stages, the authors independently reviewed the titles of citations, abstracts and full texts of potentially eligible studies.
The interevaluator agreement for the selection and review was high. Disagreements were resolved by consensus. Of the studies chosen for the quantitative analysis, the data of interest were extracted independently and in duplicate of the full text of each manuscript. Subsequently, the data extracted by each reviewer for the statistical analysis were compared. No disagreements was recorded.

The Risk of Bias for individual Studies

The risk of bias was evaluated using the Cochrane Risk of Bias Tool in the case of the Randomized Clinical Trials and for the quasi-experimental studies before and after it used the Downs and Black List.[26] Bias analysis was performed individually with the included studies.

Summary Measures

In the Forest Plots resulting from the quantitative analysis, the difference in means between the basal and final measurements of the outcome variables (Abdominal Circumference and Thigh Contour) was used as a summary measure. The basal and final measurements of outcome variables were expressed as means and standard deviation. The mean differences of each included study and the global of each Meta-Analysis were expressed together with the corresponding 95% Confidence Interval.

Summary of Results

A Meta-Analysis was made for each of the outcome variables (Abdominal Circumference and Thigh Contour); both analyses have been expressed as Fixed Effect Models and Random Effects Models. We performed sensitivity analyses excluding each of the chosen studies and by subgroups, based on other variables of interest. Sensitivity analyses were expressed in their entirety in random effects models. Heterogeneity was evaluated using the I2 index. The software RevMan version 5.3.5 was used for every analyses[27].

Results

Identification of the Studies

The bias analysis was performed individually with the systematic research of literature beginning with a phase of identification of studies of interest, in which we applied our search algorithm and we obtained, after excluding the duplicates, 285 related citations, (*Figure 1*).

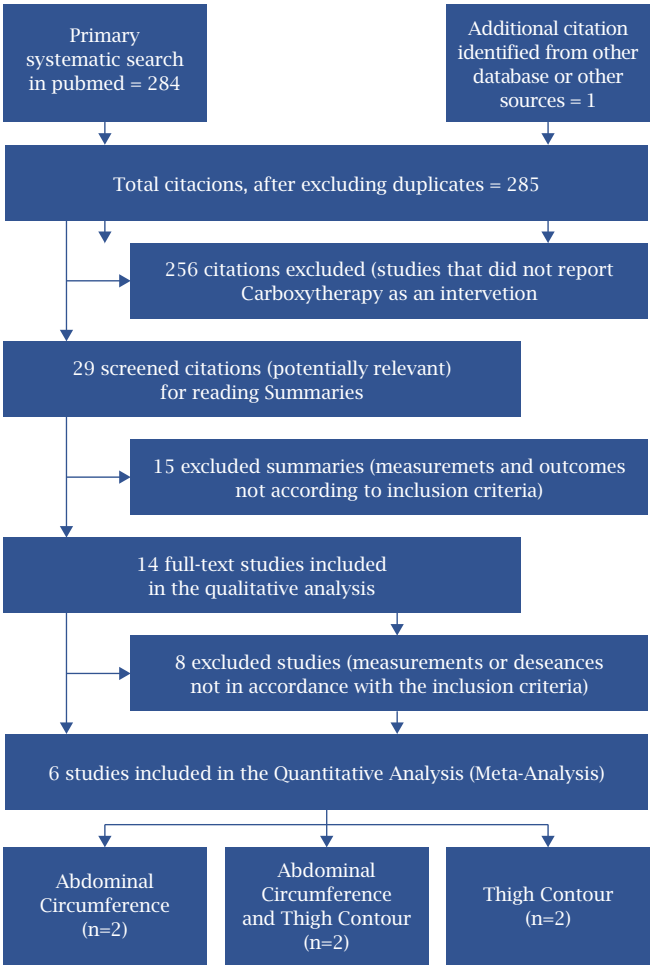

Figure 1 *- Article search process and results, totaling 6 articles.*

Subsequently, after a first screening filter with the reading of the titles, 256 citations were excluded in which Carboxytherapy was not an intervention. In the remaining 29 citations, the authors independently reviewed the abstracts and excluded 15 studies that did not describe the measurements established in the inclusion criteria. Finally, in an election phase, the full text of the remaining 14 studies was analysed. This review was carried out independently by the authors with included studies.
After analyzing the quality of the studies (*Figure 2*), the presentation of the outcomes of interest and the form of the measurements were considered; 8 studies that did not meet the criteria were excluded.
The 6 resulting studies (4 quasi-experimental Before and After studies and 2 Randomized Clinical trials) were included in the Quantitative Analysis.
Table 1 provides the details of the included studies.

ARTICLE	STUDY DESING	PATIENTS	INTERVENTION	FOLLOW UP	FINAL OUTCOMES	COMMENTS
Alam et al. 2018[22]	Randomized, Controlled and Masked Clinical Trial	n = 16 healthy participants (6 men and 10 women) with BMI 22-29, over 18 years of age.	SC injection of 1000cc of CO2 per session in abdomen. One session per week for 5 weeks. Infusion speed 50cc / minute.	AC measurement, after the intervention is finished	Decrease of 1.11cms in the abdominal perimeter [95.53 (14.11) vs 94.42 (14.26); p = 0.07]	The measurement of the abdominal circumference was made at the height of a transverse plane that passed through the navel.
Brandi et al. 2001[2]	Quasi Experimental Study Before and After	n = 48 women from 24 to 51 years old, with adiposity located in the thighs, of which 14 also had them in the abdomen	SC injection of 150cc of CO2 per session in the abdomen and 300cc in the thighs. Two sessions per week for 3 weeks. Infusion speed 50cc/minute.	Measurement of the AC and the TC, 1 day after the end of the intervention	Decrease of 2.70cms in the abdominal circumference [78.4 (8.9) vs 75.7 (7.5); p <0.01] and 1.9cms in the thigh contour [56.1 (4.3) vs 54.2 (3.9); p <0.01]	
Costa et al. 2011[7]	Quasi Experimental Study Before and After	n = 15 women with BMI 20-25, from 24 to 50 years old, with adiposities located in the abdomen and without signs f lipodystrophy	SC injection of 250cc CO2 per session. Two sessions per week for a total of 6 sessions, with intervals of 2-3 days between them. Infusion speed 80cc/minute.	AC measurement, 1 week after the intervention was finished	Decrease of 2.44cms in the abdominal circumference [83.17 (7.9) vs 80.73 (8.1); p = 0.31]	The measurement of the abdominal circumference was made at the height of a transverse plane that passed through the navel.
Eldsouky et al. 2018[21]	Randomized, Controlle and Masked Clinical Trial	n = 48 healthy women (including controlled hypertensive patients) with BMI ≤40 divided into 2 groups. 24 of them in the Carboxytherapy group, from 25 to 54 years old	SC injection of 200-300cc of CO2 per session in each thigh. One weekly session for 6 consecutive weeks. Infusion speed 50cc / minute.	Measurement of TC, 2 weeks after the end of the intervention.	Decrease of 3.95cms in the contour of the right thigh [67.68 (5.5) vs 63.73 (4.3); p = 0.01] and 3.71cms in the contour of the left thigh [66.54 (5.2) vs 62.83 (4.7); p = 0.01]	The measurement of the TC was performed at the height of an intermediate point between the ASIS and the Knee.
Lee et al. 2010[10]	Quasi Experimental Study Before and After	n = 111 healthy participants (including controlled hypertensive), from 20 to 50 years old. By sex, there were 101 women with adiposities located in the abdomen, of whom 57 also had them in the thighs and 10 men with adiposities located in the abdomen.	SC injection of 500-1000cc of CO2 per session in the abdomen and 800-1000cc per session, in each thigh. 5 sessions with intervals of 1-2 weeks between them. Infusion speed 50-100cc/minute.	Measurement of theAC and the TC, after the treatment is finished.	Decrease of 1.6cms in the abdominal circumference [79.9 (7.0) vs 78.3 (6.0); p <0.05] in women aged 20-29 years, 2.3cms [83.3 (7.5) vs 81.0 (7.5); p <0.05] in women aged 30-39 years and 2.5cms [85.0 (8.1.) Vs 82.5 (7.3); p <0.05] in women aged 40-49 years.	The measurement of the abdominal circumference was made at the height of a transverse plane that passed through the navel. The measurements (before and after) of the TC were made at the same height in each patient, taking as reference the ASIS. In men, no significant decreases were found in AC measurement. In women, no significant decreases were found in the TC.
Lee et al. 2016[8]	Quasi Experimental Study Before and After	n = 10 healthy women (including controlled hypertensive), from 23 to 37 years old.	SC injection of 200-300cc of CO2 per session, in the right thigh. 8 sessions. Infusion speed 100cc / minute.	Measurement of the right TC, 1 week after the intervention ended.	Decrease of 1.3 cm in the contour of the right thigh [56.3 (4.3) vs 55.0 (4.4); p = 0.0008]	The measurements (before and after) of the right thigh were performed at the same point in each patient, taking as reference the ASIS.

Table 1 *- Evidence Table. Details from Reviewed studies included in the Meta-Analysis.*

Figure 2 *- Risk of bias analysis of the RCTs included in the meta-analysis using the Cochrane risk of bias tool. RCT: Randomized Clinical Trial. Biases evaluated: Generation of the random sequence; concealment of allocation; masking of participants and staff; masking of the outcome assessors; incomplete result data; selective reporting of results and other sources of bias. Classification of risk of Bias: high (red), intermediate (yellow), low (green).*

Thigh Contour

Figure 3 shows the effect of carboxytherapy for the treatment of adiposities located on thighs. Four studies have been included in this analysis[2,15,28]. The study of Lee et al. 2010[15], has been divided into 3, since the original article presents its results divided by age groups (20-29, 30-39 and 40-50). Under a Fixed Effects Model (Figure 3A) and with a total sample of 139 patients with adiposities located on thighs, carboxytherapy produced a significant decrease in the contour of the thighs of 1.92 cm (95% CI 0.90-2.95; p < 0.0001). By repeating the analysis under a random effects model (*Figure 3B*), the same result was obtained. In each of these analyses the results of the Chi-square Test for Heterogeneity were not significant (p> 0.05, I2 = 0%).

Abdominal Circumference

Figure 4 shows the effect of carboxytherapy for the treatment of adiposities located in the abdomen. Four studies have been included in this analysis[2,10,15,29].
The study of Lee et al. 2010 15 has been divided into 6, since the original article presents its results broken down by sex and age groups (20-29, 30- 39 and 40-50). Under a Fixed Effects Model (Figure 4A) and with a total sample of 156 patients (140 women and 16 men) with adiposities located in the abdomen, carboxytherapy achieved a significant decrease in the abdominal circumference of 2.15 cm. (IC95% 0.45-3,85, p = 0.01). By repeating the analysis under a Random Effects Model (Figure 4B), the same result was obtained. In each of these analyses the results of the Chi-square Test for Heterogeneity were not significant (p> 0.05, I2 = 0%).

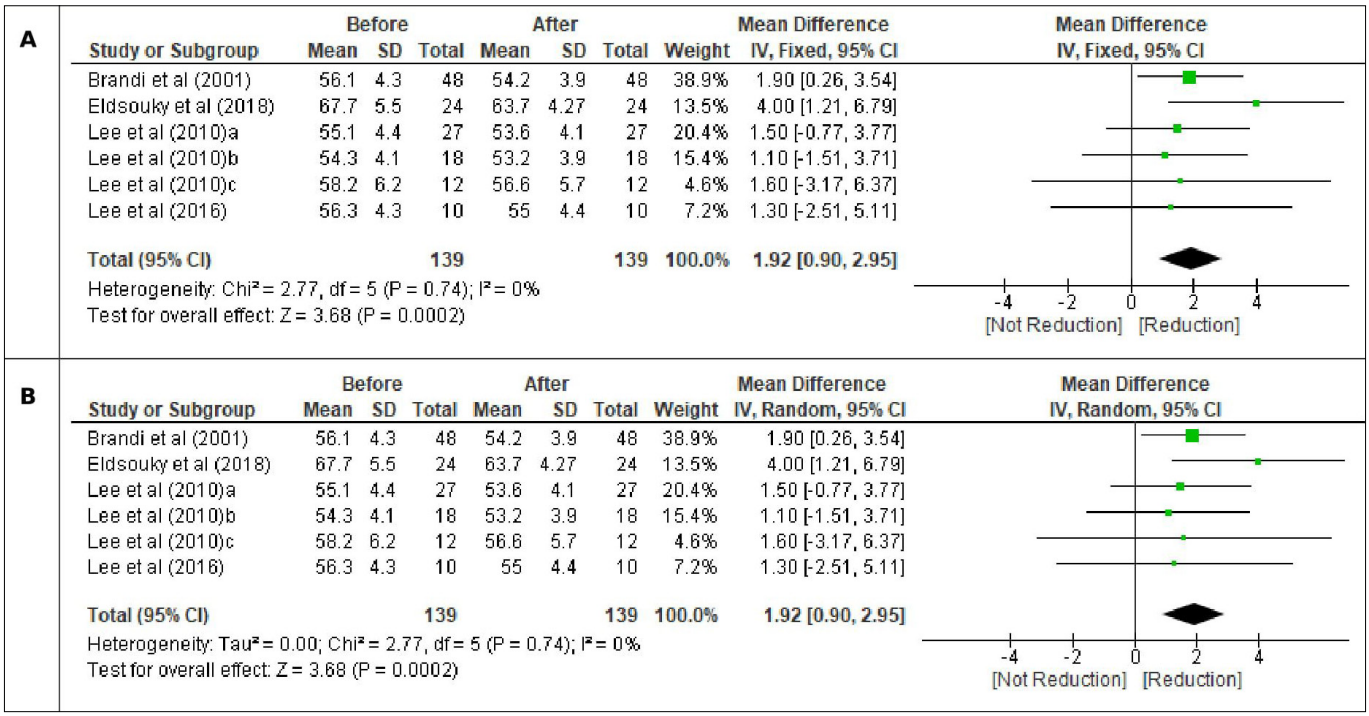

Figure 3 *- Forest plot of the effect of carboxytherapy in the treatment of adiposities located on the thighs. The mean differences (before and after) and their standard deviation of the contour of the thighs in each included study were taken as original data. The outcome variable is expressed in centimeters (cms). The study by Lee et al (2010) has been divided into 3, by the way in wich their result have been published, by age groups: 20-29 years old and c 40-50 years old. A) Fixed Effects Model. B) Random Effects Model.*

Sensitivity Analysis

Tables 2 and *3* show the analysis by subgroups with other variables of interest: the volume injected (cc), the total sessions, the weekly frequency and the speed of the carbon dioxide infusion. For adiposity in the thighs a significant increase in the reducing effect was obtained: in the group injected with <500 cc of carbon dioxide per session, those who received 6 or more sessions of carboxytherapy with a frequency of 1 weekly session at an infusion rate of ≤50cc / minute.

On the other hand, in the adiposities located in the abdomen, we also found an increase in the reducing effect: in the group in which <500cc of carbon dioxide per session were injected, and in which the infusion rate of the carboxytherapy was ≤ 50cc / minute; however, this increase in the effect was not significant. Regarding the weekly frequency of the sessions, for the abdominal circumference, the group that received 2 weekly sessions showed an increase in the effect (not significant).

Publication Bias

The visual inspection of the Funnel Plot for each outcome does not show asymmetry (*Figure 4*), a finding that suggests the absence of publication biases. This finding was confirmed by the absence of significance in the Begg test for each of the outcomes (p = 0.71 for thigh contour and p = 0.73 for abdominal circumference).

Complications

Minor complications were observed after the treatment with Carboxytherapy: pain, erythema, bruising, swelling, tenderness and emphysema. These side effects usually resolved a few weeks after the treatment. There are no persistent ulcerations, scars, paresthesias, bruises, blisters, bleeding, hyperpigmentation or hypopigmentation. No infections were reported in any of the included studies. In the study by Alam et al.[29] the pain was measured with the Visual Analogue Scale, showing a pain of mild / moderate intensity (on average between 2.7 and 3.34 in each session).

STUDIES INCLUDED	n	EFFECT	IC95%		% OF VARIATION
			LL	UL	
Inyected Volume					
<500cc x Session	82	2.30	0.98	3.63	19.8%
≥500cc x Session	57	1.36*	-0.25	2.97	-29.2%
Total of Sessions					
5 Sessions	57	1.36*	-0.25	2.97	-29.2%
≥6 Sessions	82	2.30	0.98	3.63	19.8%
Weekly frequency					
1 Weekly Session	24	4.00	1.21	6.79	108.3%
2 Weekly Session	115	1.96	0.50	2.70	2.1%
Infusion Speed					
<50cc/minute	72	2.64	0.67	4.60	37.5%
≥50cc/minute	67	1.35*	-0.16	2.84	-29.7%
GLOBAL	139	1.92	0.90	2.95	

Table 2 *- Efficacy of carboxytherapy in treatment of adiposities located on thighs. Analysis stratified by subgroups with other variables of interest.*

STUDIES INCLUDED	n	EFFECT	IC95%		% OF VARIATION
			LL	UL	
Inyected Volume					
<500cc x Session	29	2.56*	-1.60	6.73	19.1%
≥500cc x Session	127	2.07	0.20	3.93	-3.7%
Total of Sessions					
5 Sessions	127	2.07	0.20	3.93	-3.7%
≥6 Sessions	29	2.56*	-1.60	6.73	19.1%
Weekly frequency					
1 Weekly Session	127	2.07	0.20	3.93	-3.7%
2 Weekly Session	29	2.56*	-1.60	6.73	19.1%
Infusion Speed					5.1%
<50cc/minute	30	2.26*	-2.92	7.44	
≥50cc/minute	126	2.14	0.33	3.94	-0.5%
GLOBAL	156	2.15	0.45	3.85	

Table 3 *- Efficacy of Carboxytherapy in treatment of adiposities located in abdomen. Analysis by stratified by Subgroups with other variables of interest.*

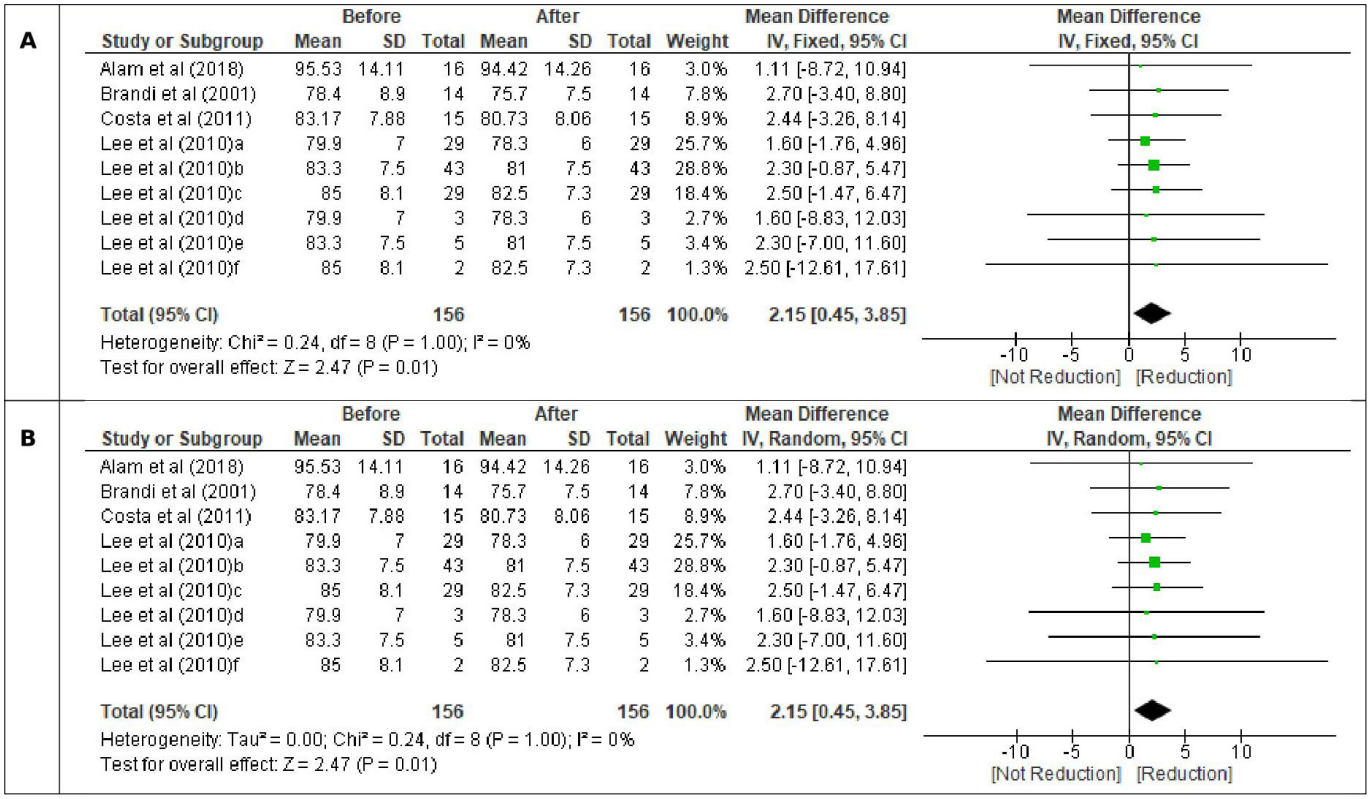

Figure 4 *- Forest plot of the effect of carboxytherapy in the treatment of adiposities locatedin the abdomen. The mean differences (before and after) and thei standard deviation of the abdominal perimeter (AP) in each included study were taken as original data. The result variable is expressed in centimeters (cms). The study by Lee and cols (2010) has been divided into 6, by the way in wich their result have been published, by sex and age groups: A) Women of 20-29 years , B) Women of 30-39 years, c Women of 40-50 years, men of 20-29 years, men of 30-39 years and men of 40-50 years. A) Model of Fixed Effects. B) Random Effects Model.*

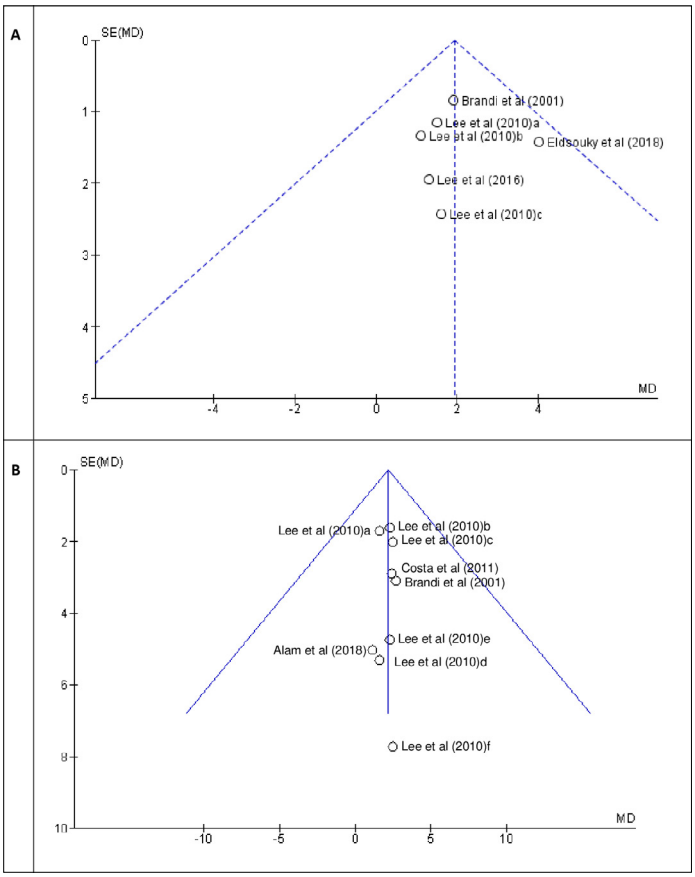

Figure 5 *- Funnel Plot of the effects of Carboxytherapy in the treatment of localized adiposities. The study of Lee and cols (2010) has been divided into 6, by the way in wich their results have been published, by sex and age groups: a women of 20-29 years, c Women of 40-50 years, men of 20-29 years, men of 30-39 years and men of 40-50 years. A) effect of Carboxytherapy on the contour of the thighs. B) effect of Carboxytherapy on the abdominal circumference.*

Discussion

For some years now, non-invasive new technologies have revolutionized the treatment for localized fat and body contouring. The main objective of these therapies includes a reduction in tissue volume, with a non-invasive or minimally invasive treatment. Carboxytherapy is becoming one of the most popular and profitable alternatives for the reduction of adipose tissue, due to the ease of use and its minor adverse effects.

The available literature on the mechanism of action in adipose tissue and its use in the treatment of localized adiposities remains limited. Its application is performed in an altruistic or empirical way, generally not knowing its mechanism of action and its effectiveness.

This meta-analysis has shown that carboxytherapy is effective for the treatment of localized adiposities, achieving a significant reduction of the contour of the thigh and the abdominal circumference. Through sensitivity analysis, it was demonstrated that variables such as the volume injected, the number and frequency of sessions, and the infusion rate, influence these results. For adiposities located on thighs, there was a significant increase in the reduction effect by injecting

little volume at a slow injection rate, with a weekly session and a duration of at least 6 sessions. On the other hand, in the localized adiposities of the abdomen, we also found an increase in the reducing effect in these same groups, with a difference in the number of weekly sessions, since in this group the frequency of 2 sessions per week seemed to have better results although without the expected relevance.

This difference between results of covariates mentioned above, suggests that carboxytherapy is more effective for the treatment of adiposities located in thighs than in the abdomen. These findings may be related to the presence or absence of cellulitis, which is more frequent in thighs, since besides decreasing the adipose tissue, the collagen fibers reorganize and distribute more uniformly and the microcirculation is improved. However, these results should be interpreted with caution, because when performing the sensitivity analyses, the subgroups of interest included less than 30 individuals. Studies with a larger sample size would be required to allow for the stratified analysis to have more power, and it could be possible to establish which treatment zones are more susceptible to improvement. In the clinical studies analysed, it was shown that the benefits of carboxytherapy are limited to reduce the abdominal circumference in men. Although this can be explained by the lack of sufficient male patients, (n = 16), it can also be due to the distribution of visceral or central fat in men, compared to women who have a greater amount of body fat; most of which (80-90%) is stored in the gluteal-femoral fat deposits and in the lower part of the body[30]. These results, however, can be checked or discarded if the effect of carboxytherapy on adipose tissue is not measured in centimeters of the abdominal circumference, but by ultrasound before and after treatment [11,15,29].

The duration of the reducing effect on adipose tissue has not been reported either. Although Brandi et al.,2 state that the results are maintained after three months of follow-up, specific data were not provided. Eldsousky et al.[28],reported that 66.7% of patients kept their results after 6 months of follow-up and 33.3% of patients showed a regression. This temporal effect of carboxytherapy may be secondary to the histological findings found in two studies[7,10]. These authors confirm that the number and size of adipocytes decrease in the treated areas, suggesting a mechanism of adipocyte lysis and lipolysis, with an adipocyte emptying without cell death (adipocytolysis). Therefore, carboxytherapy can cause a transient decrease in the thickness of the fat layer. In the study by Alam et al.[29],the treated flanks did not maintain the decrease after six months of follow-up.

The low profile of adverse effects is one of the main advantages of the use of Carboxytherapy. After review of the literature included in this study, no serious adverse effects were reported. The reported effects were minor, including bruising, minor subcutaneous emphysema and pain at the site of the infusion. Only four studies[2,11,28,29] have been quantified and reported pain. The puncture was performed systematically with a 30G needle in 5 studies. Alam used a 26G needle. In the study by Costa et al.10 a standardization of the injection method and calculation of the dose to be injected was made, based on the calculation of the surface in square meters, performing multiple punctures with low volumes. In contrast, Alam[29] decided to perform a single puncture to minimize the risk of infection. However, no cases of infection were reported in any of these studies regardless of the number of punctures.

The evidence regarding the reduction of fatty tissue with carboxytherapy has never been conclusive. This meta-analysis condenses the evidence available in previously published studies on this subject and after obtaining a larger sample size, it shows that this treatment is effective to significantly reduce the abdominal circumference and the contour of the thigh. Additionally, through the sensitivity analysis we showed the influence of other covariates on the result; an approach that to date has not been considered by other authors.

Conclusions

This study presents the first Systematic Review and Meta-Analysis of the available data on Carboxytherapy in the treatment of localized adiposities. Although the set of studies on these subject is limited, and the mechanism of action of Carboxytherapy on adipose tissue is not fully understood; we verified with our data that Carboxytherapy is an effective and safe procedure in the short term, for non-surgical fat reduction and body contour, finding a significant reduction in the contour of the thigh and the abdominal circumference.

The efficiency in the treatment of the adiposity of the thighs is improved by performing a weekly session, with a minimum of 6 sessions, with little volume injected per area (<500cc) and at a slow infusion rate (50cc / min). A frequency of twice a week seems to be more effective for the abdomen. The result may be limited for men, probably secondary to their distribution of body fat.

A major problem in applying medicine based on evidence in the field of aesthetic medicine is that the results are subjective and difficult to quantify. The results of this study are of great importance, since they allow for the establishment of a protocol for the treatment of localized adiposities with Carboxytherapy. Future studies should have the authority and the appropriate design to determine which treatment and which areas are more suitable for reducing adipose tissue with this therapy.

Disclosures

There are no conflicts of interest regarding the contents of this article.

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aesthetic medicine

Mini Review

Early geriatric syndrome screening for aesthetic medicine practitioners

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Abstract
In recent decades issues in the monitoring of age-related alterations, prevention of age-related conditions and diseases are no longer an exclusive domain of gerontologists. Anti-aging medicine is an area of interest for medical professionals of other fields too. Preventive geriatrics (anti-aging medicine) is a new interdisciplinary area for medical research and practice. It studies early detection, prevention and treatment of age-associated clinical disturbances and diseases.
Aesthetic medicine doctors (aesthetic medicine specialists/aesthetic dermatologists) are more frequently seen as primary care point for patients seeking medical advice. Seeking treatment of various esthetic issues such patients also expect aesthetic medicine doctors to provide preventive health-related recommendations. One should take into account that currently it is an extremely rare case when patients monitor their medical status continuously. On the contrary, they seek medical treatment and advice only when clear clinical symptoms emerge. Thus, early diagnosis for age-associated disorders, risk group identification followed with referral to subspecialists are to be shouldered by aesthetic medicine doctors. Nowadays there are over 65 geriatric syndromes resulting in early aging and senile asthenia. The most relevant are age-related hormonal deficit syndrome, sarcopenia, metabolic syndrome, senile osteoporosis, malnutrition syndrome, cognitive disorders. Our article describes early screening algorithms for the given syndromes aesthetic medicine doctors might face.

Keywords
Age-related, Geriatric syndrome, Anti-aging medicine, Screening

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Age-related hormonal deficit syndrome

Aging brings forth significant alterations in endocrine organs and systems. This is most apparent in female reproductive system aging. However, all endocrine glands develop various involutional transformations associated with lower production for the majority of hormones and lower receptor sensitivity to them. This is true for sex and thyroid hormones, growth hormone and related insulin-like growth factor 1 (IGF-1), and some adrenal steroids.

Menopause

The climacteric period is a physiological stage of any woman's life between fertility and senility. The crucial event of this period is the menopause, which is the last spontaneous menstrual bleeding in woman's life. Quite often the entire climacteric is called menopause.
This period shows the most significant hormonal transformations, as the body undergoes complex changes adapting to low sex hormones in blood and the reproductive function comes to a close.
Usually the climacteric is divided into three major time-dependent groups of symptoms: early, mid-term and late (*Table 1*)[1], each of which has its own typical signs and requires different approaches to diagnosis, prevention and treatment.

Andropause

Similar to menopause in women it is customary to talk about andropause in men, which is a syndrome having typical clinical symptoms along with low blood testosterone. Unlike menopause andropause is not an obligatory stage of life. Risk factors for andropause include age, somatic disorders, chronic toxication, sedentary lifestyle, fasting and vegetarian diet. Sometimes age-related testosterone drop is seen in women as well.
Clinically, andropause is presented with impaired sexual function and fertility, obesity, urination disorders, lower skeletal muscle strength and mass, osteoporosis, lower back and joint pain, asthenia, various psycho-emotional disorders[2]. Besides, when visiting their patients aesthetic medicine doctors might be faced with complaints on lower skin and mucosa elasticity and dryness, altered body smell, and body hair loss.

Somatopause

Growth hormone (GH) decreases steadily with aging in both men and women: it drops 50% every 7 years[3].
Via insulin-like growth factors (IGF) GH affects directly or indirectly protein, lipid and carbohydrate metabolism, mineral and fluid and electrolyte balance, bone metabolism as well as showing some immunotropic and neuromediatory properties. In elderly patients GH shortage is accompanied with sarcopenia, osteoporosis, fat-related weight gain and emotional disturbances with depression features. Moreover, low GH and IGF-1 are associated with longer life span due to decreased cancer risks, higher oxidative stress resistance and higher insulin sensitivity in tissues[4].

Metabolic syndrome

Metabolic syndrome (MS) is a composite of pathogenetically linked alterations of carbohydrate, lipid, purine metabolism, abdominal obesity and high blood pressure[5]. Early diagnosis of MS is an extremely relevant issue, since its timely treatment can prevent or delay type 2 diabetes and atherosclerosis development, which are major causes of higher mortality. Considering the aforementioned it is essential to identify early MS signs and risk groups, especially for patients in aesthetic medicine quite often seen and examined well before any somatic complaints emerge. MS patients visiting their aesthetic medicine doctors complain mostly on overweight with predominant fat deposits at abdominal and waist areas, inability to lose weight, fatigue, apathy, frequent headaches, increased appetite and thirst, dry skin, enhanced sweating. When examining patients, one should pay attention to the following risk groups:

1) Patients with signs of CAD or other atherosclerotic diseases.
2) Healthy subjects noted upon examination to have at least one of early metabolic syndrome signs (high blood pressure, obesity, impaired glucose tolerance or type 2 diabetes, hyper- and/or dyslipidemia).
3) Close relatives of patients with early (for male - below 55, for female - below 65) signs of atherosclerotic disorders.

Group	Onset time	Symptoms
Group 1 (early symptoms)	Transition to menopause (about 45 to 53, sometimes – considerably longer)	· Vasomotor («hot flushes», sweating, palpitation, hypertension) · Psycho-emotional (insomnia, depression irritability, memory issues, lower libido, headache)
Group 2 (mid-term symptoms)	Approximately 2-4 years post- menopause (about 55 to 60)	· Urogenital (vaginal dryness, itching and burning, dyspareunia, cystalgia, urinary incontinence) · Trophic skin alterations (dry skin, wrinkles, brittle nails, hair loss)
Group 3 (late symptoms)	Several years post- menopause (55 years of age and older)	· Metabolic (cardiovascular disorders, osteoporosis, Alzheimer disease) · Facial bone alterations, atrophy signs in skin, subcutaneous fat and muscles

Table 1 *- Clinical manifestations at various climacteric time points[1].*

MS risk factors and early signs, if identified, are a rationale to advise such patient to visit an endocrinologist. Also the importance to diagnose this condition early and to start treatment timely should be particularly emphasized.

Malnutrition syndrome (insufficient nutrition)

Restricted calorie and food consumption may result in the development of protein and energy (insufficient regular food intake) or partial malnutrition (insufficient intake of specific substances such as vitamins) exhibited with lower weight and smaller body size, changes in laboratory parameters (low cholesterol and albumin, blood glucose fluctuations, lymphopenia, low transferrin)[6]. Decreased fat volume results in such dangerous systemic effects as low sex hormones, elevated clot formation, accelerated atherogenesis, sarcopenia, glucose blood level fluctuations, chronic immune inflammation.
These alterations are manifested as early aging syndrome and poorly performing aesthetic procedures. In case of malnutrition syndrome patients might complain to their aesthetic medicine doctors of brittle nails, slowly growing hair and hair loss, low skin tone, flaccid facial and body skin, rapid wrinkle formation.

Sarcopenia

Sarcopenia is an age-related atrophic degeneration of skeletal muscles resulting in gradual loss of their mass and strength[7]. This term is not conventionally applied when describing muscle mass loss with various secondary disorders (severe infections, cancer wasting, etc.). Skeletal muscles and their appearance play an important role not only for the way body aesthetics is perceived but also for the patient's quality of life and its maintenance: skeletal muscle atrophy increases fall risks, facilitates osteopenia and insulin resistance development[8].
Sarcopenia pathogenesis is quite complex and influenced by a whole range of various factors: restricted nutrition (low protein intake), hormonal age-related involution, immune-dependent inflammation, lower muscle regeneration and oxidative stress.
Visiting their aesthetic medicine doctor patients might complain of disproportionate body shape (flaccid soft tissues on shoulders, abdomen, buttocks), postural disorders, rapid fatiguability and muscular weakness. Sarcopenia risk factors include older age, unbalanced calorie-restricted nutrition, prolonged immobilization, type 2 diabetes, obesity, cognitive deficit, vitamin D and B12 deficit, behavioral factors (smoking, alcohol, sedentary lifestyle).
To prevent sarcopenia the risk group patients should be offered to exercise appropriately with weight-lifting training, proper nutrition, adequate intake of calcium and vitamin D, use of peptide bioregulators, and if there are indications and if relevant subspecialists recommend - hormonal replacement therapy and osteoporosis treatment.

Osteoporosis

Osteoporosis risk factors can be identified in almost every woman above 60. They include hormonal disturbances, low calcium and magnesium intake, vitamin D deficit, protein insufficiency, sedentary lifestyle and excessive alcohol, smoking and coffee consumption.
Osteoporosis is a metabolic skeletal disease with decreasing bone mass, impaired bone tissue architecture and, therefore, minimal trauma fractures[9]. Public relevance of osteoporosis determined by its consequences – vertebral body and skeleton bone fractures.
Densitometry-based bone screening should be strongly recommended in all menopausal patients, especially if any additional risk factors are present[10]. Besides, one should remember that type 1 collagen represents more than 70% of skin as well as bone tissue. Pathophysiology processes associated with age-related connective tissue atrophy are interrelated. Decreased skin thickness (as USG data shows) can be considered as a risk marker for osteoporosis and related fractures in menopausal women[11].
Sufficient calcium consumption along with vitamin D provision and adequate physical activity are important factors for osteoporosis prevention. Also normal weight-to-height parameters should be maintained (BMI within the range of 20 to 25). If indicated, hormonal replacement therapy is prescribed. And in case of diagnosed osteoporosis, a specific treatment is given to patients.

Cognitive disorders

Probable cognition issues in patients might be suspected if there are depression symptoms, complaints of sleep and memory disturbances, nervous orthorexia (pathologic healthy diet adherence), dysmorphophobia and dysmorphomania signs[12]. Restoration of normal sleep and wake cycle, nutritive support (consuming sufficient amounts of flavonoids, vitamins E and D with food) are of great value for early prevention and treatment in case of initial cognitive disorders signs. Another important aspect is daily cognitive training and sufficient physical exertion. Pharmacotherapy for cognitive disorders includes nootropic and neuroprotective agents.

Conclusion

Nowadays current medicine assumes the need for close contact and communication among specialists of different fields in order to generate the unified concept of rejuvenation techniques and their use. A set of interventions is considered as the most promising when it is aimed not only at the alleviation of external aging signs (which is a conventional area of interest for aesthetic medicine doctors and plastic surgeons) but also at the functional improvement in cardiovascular, nervous and locomotor systems. An aesthetic medicine doctor is the one who quite often stands as a facilitator summing up efforts of various medical professionals

and their vision into a single, unifying paradigm.

Recently along with improved life span also a phenomenon of so-called early aging appeared assuming higher age-related disease incidence in younger patient groups. First of all, it is related to cardiovascular diseases, atherosclerosis, cognitive disorders and diabetes[13].

Simple screening tests introduced in aesthetic practitioner daily routine makes possible to detect initial functional deviations of patient clinical performance and to refer them timely to appropriate subspecialists as well as to apply relevant preventive interventions. When visiting a patient for the first time, one should be highly specific discussing such issues as lifestyle, sleep pattern, labor activity, food behavior and harmful habits. When talking to a patient one should analyze the patient's emotional background and behavior during the visit and how they react to examination. Moreover, during this visit one should not skip weight and height measurements, assessing blood pressure and heart rate. Even such simple tests make it possible, at least, to assess to some extent patient cardiovascular status and identify nutrition disturbances. The following screening laboratory and instrumental tests and methods are considered as the most useful when looking for signs of the most prevalent geriatric syndromes: total protein, liver enzymes, HbA1C, glucose, lipid profile, TTH and vitamin D. When abnormal parameters are detected it is necessary to explain them and to convince your patients to visit relevant subspecialists. Thus, treatment and preventive interventions for age- related diseases can be provided timely.

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aesthetic medicine

Mini Review

Diet and Skin

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Abstract
When defining a preventive or corrective program in Aesthetic Medicine, an accurate preliminary evaluation of the patient's general state of health should never be left out of consideration. In particular, it is very important to investigate the patient's lifestyle since it affects skin health; smoking, stress sources, solar exposure and diet habits have all an impact on the photoaging degree.
Scientific literature has widely demonstrated that diet has a direct impact on skin health, since the micro- and macro-nutrients taken with food act in different ways on both dermis and epidermis, exerting their action at different levels. This means that a diet rich in fats and carbohydrates, for example, will cause a greater damage to the connective tissue, while the intake of large amounts of fruit and vegetables has a greater anti-oxidant action and improve skin health.
The initial evaluation helps understand the best approach for our patient and the best methods we can combine to fight against the signs of aging, attributing the right importance to a balanced diet.

Keywords
Skin Health, Aging, Nutrition, AGEs, Antioxidants

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Diet and skin

Aesthetic Medicine cannot leave out of consideration an accurate evaluation of the patient's lifestyle (eating habits, cosmetic hygiene, smoking habits, potential sources of stress, exposure to air pollution, etc.). Lifestyle is an element that significantly affects treatment outcomes, by determining patient-to-patient differences. Therefore, it is clear that during an Aesthetic Medicine visit, an accurate medical history to collect all the necessary information is crucially important.
Skin is the interface with the external world, it communicates our psychophysical well-being by reflecting the state of health and aging of the body. There are several factors that significantly affect skin: ultraviolet radiations, pollution, smoking, stress, sleep, hormones and poor diet[1,2,3]. The latter is one of the main factors responsible for skin health[4,5,6,7]. Several studies suggest that actinic damage, in particular the formation of skin wrinkles, can be associated with incorrect eating habits, while vitamins E and C, carotenoids and
Polyunsaturated Fatty Acids (PUFAs) play a protective role against photoaging. In particular, some authors observed a skin protection effect in subjects who ate large amounts of fruits, vegetables and olive oil[8,9].
Moreover, a high-calorie diet leads to changes in the skin with increased adipose tissue and reduction in the thickness of the dermis[10]. Caloric restriction, on the other hand-as evidenced in experimental studies conducted on rats-leads to a decrease in histomorphological changes deriving from intrinsic aging, with a tendency to increase collagen, elastic fibers, fibroblasts and capillaries and to the prevention of an age-related increase of the thickness of the epidermis, dermis and adipose tissue[11].
Therefore, diet exerts its action directly on the connective tissue which, as already discussed in this article, plays a fundamental role in skin aging. The connective tissue is the element of "connection" between cells and the vascular system and is, therefore, the site of exchange of the products of absorption and cellular elimination. The products of absorption are glucose, amino acids, fatty acids, minerals, vitamins, hormones, oxygen, water; the elimination products are water, catabolites, carbon dioxide, hydrogen, minerals, etc.; Therefore, macro- and micro-nutrients certainly affect the health status of connective tissue, as evidenced by studies on diet and aging[12].
In particular, scientific evidence describes the importance of carbohydrates and in particular of glucose for skin metabolic regulation. Glucose is involved in the metabolism of fibroblasts and adipocytes by exercising an energetic function and contributing to the production of nucleic acids[13,14]. Danby and colleagues have shown that glucose oscillations damage collagen fibers and compromise skin elasticity and compactness through the production of AGEs (Advanced Glycation End products) that bind to receptors called RAGE (Receptor for Advanced Glycation End products)[15,16]. RAGEs are present on fibroblasts, adipocytes, mastocytes, macrophages and endothelial cells and their number increases with solar exposition[15]. The activation of RAGEs present on the plasmatic membrane of fibroblasts induces the production of inflammatory cytokines, the glycation of collagen fibers and elastorhexis with rupture of the latter[17,15]. However, Singh R et al. have highlighted that the damage caused by AGEs may be not RAGE-mediated, but direct damage to the structure of membrane proteins may occur as well as intracellular damage and damage to the metabolism of the extracellular matrix[17].
AGEs-RAGE binding is a process that tends to self-amplify: the higher the number of AGEs that bind to RAGEs, the number of RAGEs that develop[17,18,19]. Nedic and colleagues highlighted that not only glucose, but also fructose, galactose, mannose, glucose-6-phosphate, etc.
produce AGEs[20]. Gkogklou P et al showed that, in healthy subjects, skin glycation is related to chronological age; the onset of glycated collagen occurs at around 20 years of age and accumulates at an annual rate of 3.7%, up to 30-50% at the age of 80 years[21]. Modified collagen causes rigidity and reduced flexibility thus inhibiting its elimination and replacement with new one. Moreover, Sebekova K and colleagues have shown that subjects who followed a correct diet with a balanced intake of nutrients produced less AGEs than vegetarians[22].
With reference to diet and skin health, another crucial role is played by fatty acids. Monounsaturated fatty acids, mainly contained in olive oil, avocado and sesame, reduce oxidative stress, insulin resistance and inflammatory process[23].
Conversely, the action of saturated fatty acids on fibroblasts negatively affects gene modulation that produces a reduction in hyaluronic acid and collagen with an increase in metalloproteases and heparanase.
Polyunsaturated fatty acids - such as linoleic acid (ALA), eicosapentenoic acid (EPA), docosahexaenoic acid (DHA) - contained in avocado, salmon, seeds etc., have a positive effect on gene modulation[14] and cases of inverse association with severe photo-aging are reported[23].
Another factor to consider when we talk about skin health are undoubtedly oxygen free radicals that can cause skin damage at the level of DNA or collagen and elastin proteins[24]. Also in this case, there is a strict link to diet. To contrast the effects of free radicals, it is important to follow a diet rich in antioxidants; prevention is the best and most effective way to fight the effects if extrinsic skin aging. The best prevention strategy against the noxious action of free radicals is a balanced lifestyle which includes caloric restriction (but with a balanced diet and without malnutrition, based above all on foods rich in antioxidants) along with exercise and reduced stress conditions[1,25,26].
Among all the environmental factors, UV rays - among the main sources of free radicals - are estimated to account for more than 80% of the aging process[27]. It was demonstrated that carotenoids, by reducing the expression of UVA radiation-induced metalloproteases inside keratinocytes, prevent oxidative skin damage, including oxidative damage from solar ray exposure[1,28,29].
Among the substances having antioxidant properties, there are flavonoids, in particular green tea. These substances can prevent oxidative damage and inhibit the activity of some enzymes at skin level[1]. The prevention of oxidative damage occurs through the production of proanthocyanidinsthat enhance the action of Vitamin C and E with neutralization of collagenase and elastase.

Also resveratrol has some benefits: it inhibits UVB-induced skin damage, has an anti-inflammatory and vasodilating effect, stimulates cell proliferation and collagen synthesis, with consequent inhibiting action on protease and ability to block UVB radiations[30,31,32].
Vitamin E is mainly found in nuts, seeds and cereals, and it plays a crucial role in stabilizing and protecting the membrane of adipose cells from oxidative damage. The oral and topical administration of Vitamin E helps strengthen the skin barrier function and protect from solar ray damage; moreover, it contributes to skin hydration[30,33].
Vitamin C is crucial for collagen synthesis, by fighting skin laxity[30].
Ginistein has a powerful antioxidant activity and stimulates the synthesis of superoxide dismutase (SOD) by protecting from UV-induced skin damage[34,35,36].
Vitamin B5 induces epithelium regeneration and Vitamin B9 regulates the differentiating and proliferative processes of keratinocytes and fibroblasts, and monitors the lipidic metabolism of epidermis[37].

Conclusions

As we have seen, multiple factors affect skin health and skin aging degree. Aesthetic Medicine is intended to act simultaneously on them, with a multifocal preventive and/or corrective approach. To this purpose, it is crucial to pay due attention to diet, especially in the context of a biostimulation program aimed at reducing the effects of chrono- and photo-aging. When setting up an anti-aging program, we should always consider the potential damage deriving from incorrect eating habits. Just think, for example, of a diet rich in carbohydrates which, as discussed, through the glycation of proteins causes direct damage to collagen fibers, or an excess of saturated fatty acids that damages fibroblasts. Therefore it appears clear that in order to guarantee and enhance the effects of biostimulation, it is necessary to integrate it with other specific Aesthetic Medicine methods, but above all with a correct lifestyle, which includes a healthy diet.

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Courses and Congresses 2019

4 - 6 October - Lima (Peru)
1st Scientific Congress of Aesthetic and Anti-Aging Medicine
Scientific Association of Aesthetic Medicine (ASOCIME)
San Isidro Disctrict, Lima
President: I. Ogata Matayoshi
Email: info@asocime.com.pe
Web: www.asocime.com.pe

11 - 12 October - Santiago (Chile)
13th Congress of Aesthetic Medicine of Chile
Chilean Association of Aesthetic Medicine (SOChME)
Hotel Intercontinental, Santiago
President: G. Marzullo
Email: contacto@creativaproducciones.cl
Web 1: www.congresomedicinaestetica.cl
Web 2: www.sochme.cl/

18 - 20 October - Almaty (Kazakhstan)
11th International Congress of Aesthetic Medicine, Plastic Surgery and Aesthetic Gynecology in Kazakhstan and Central Asia
Kazakhstan Association of Aesthetic Medicine and Plastic Surgery
Reception House "Bakhshasaray"
President: G. Zhumatova
Email: info@estetic.kz
Web 1: www.esteticcongress.kz
Web 2: estetic.kz

25 - 26 October - Toronto (Canada)
CAAM 16th Annual Conference
Canadian Association of Aesthetic Medicine
Hilton Toronto / Markham Suites Conference Centre
President: J. Carroll
Web: www.caam.ca

26 - 27 October - Tbilisi (Georgia)
5th International Congress of Aesthetic Medicine
Georgian Society of Aesthetic Medicine
The Biltmore Hotel, Tbilisi
President: E. Ugrekhelidze
Email: info@gsoam.ge
Web: www.gsoam.ge

31 October - 2 November - Cascais, Lisbon (Portugal)
4th National Congress of Aesthetic Medicine
Portoguese Society of Aesthetic and Anti-Aging Medicine
Hotel de Oitavos
President: J. P. Vale
Web: www.spme.pt

6 - 8 November - La Paz (Bolivia)
2nd Bolivian Congress of Aesthetic Medicine
Bolivian Association of Aesthetic Medicine (ASOBOME)
Hotel Atix La Paz
President: D. Hurtado Terrazas
Facebook page

8 - 10 November - Long Beach California (USA)
16th AAAM Congress
American Academy of Aesthetic Medicine - AAAM
President: M. Delune
Email: delegate@aaamed.org
Web: www.aaamed.org

14 - 15 November - Algers (Algeria)
Congress of the Algerian Society of Aesthetic Medicine (SAME)
President: M. Oughanem
Email: oughanem_m@hotmail.com

28 November - 1 December - Belek (Turkey)
3rd National Medical Aesthetic Congress
Turkish Association of Medical Aesthetic Medicine
Kaya Palazzo Golf Resort Hotel, Belek - Antalya
President: H. Subasi
Email: mestder@opteamist.com
Web: mestder2019.org

6 - 8 December - Moscow (Russia)
8th National Congress of Plastic Surgery, Aesthetic Medicine and Cosmetology
Russian Society of Aesthetic Medicine
President: O. Panova
Email: info@rs-am.ru
Web: www.rs-am.ru

Courses and Congresses 2020

20 - 22 February - Malaga (Spain)
35th National Congress of the Spanish Society of Aesthetic Medicine
Palacio de Ferias y Congresos, Malaga
President: P. Vega
Email: seme2020@pacifico-meetings.com
Web: www.seme2020.org

13 - 14 March - Mexico City (Mexico)
17th Mexican Scientific Congress of Aesthetic and Anti-aging Medicine
Mexican Society of Aesthetic Medicine
Pepsi Center WTC, Mexico City
President: B. Miller Kobisher
Email: inscripciones@congressmcme.com
Web: congressmcme.com

2 - 3 May - New Delhi (India)
International Congress of Indian Society of Aesthetic Medicine
President: A. Rana
Web: www.indiansocietyofaestheticmedicine.com

15 - 17 May - Kiev (Ukraine)
13th European Congress of Aesthetic Medicine - UIME
Organised by **Ukrainian Society of Aesthetic Medicine**
President: V. Tsepkolenko
Web: usam.org.ua

20 - 22 May - Medellin (colombia)
12th Colombian Congress of Aesthetic Medicine
Colombian Society of Aesthetic Medicine
President: G. Arroyave Estrada
Email: acicme.com.co
Web: acicme.com.co

22 - 24 May - Rome (Italy)
41st SIME Congress
Italian Society of Aesthetic Medicine
Rome Cavalieri Congress Center
President: E. Bartoletti
E-mail: congresso@lamedicinaestetica.it
Web: www.lamedicinaestetica.it

28 - 30 May - Pretoria (South Africa)
15th Aesthetic Medicine Congress of South Africa
Aesthetic and Anti-aging Medicine Society of South Africa
President: D. Norval
Email: info@aestheticdoctors.co.za
Web: aestheticdoctors.co.za

13 - 14 June - Opatija (Croatia)
3rd Congress of the Croatian Society of Aesthetic Medicine (HUEM)
Hotel Milenij Opatija
President: E. Bunar
Email: congress@huem.eu
Web: huem.eu

15 - 17 October - Quito (Ecuador)
XIII Pan American Congress of Aesthetic Medicine - UIME
Organised by: **Ecuatorian Society of Aesthetic Medicine**
President: V. Tinoco Kirby
Email: medesteticapanam2020@gmail.com
Web: www.seem.com.ec

3 - 5 December - Cascais, Lisbon (Portugal)
5th National Congress of Aesthetic Medicine
Portoguese Society of Aesthetic and Anti-Aging Medicine
President: J. P. Vale
Web: www.spme.pt

Courses and Congresses 2021

4 – 6 March – Mexico City (Mexico)
23rd World Congress of Aesthetic Medicine - UIME
Organised by **Mexican Scientific Society of Aesthetic Medicine**
18th Mexican Scientific Society of Aesthetic and Antiaging Medicine
Pepsi Center WTC, Mexico City
President: B. Miller Kobisher
Email: congreso@ippc.mx
Web: congressmcme.com/2021

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