DOSSIER DI APPROFONDIMENTO PRELIMINARE CARBOSSITERAPIA IN MEDICINA ESTETICA

Il Collegio delle Società Scientifiche di Medicina Estetica ritiene utile divulgare un dossier di approfondimento preliminare sulla Carbossiterapia in Medicina Estetica a seguito dei recenti servizi mediatici (15.02.23) che hanno generato confusione ed allarmismo ingiustificato verso una terapia considerata sicura in Medicina Estetica.

Questo documento, come indicato è un elaborato preliminare e potrà essere soggetto ad integrazioni e modifiche, il board invita chiunque tra i colleghi abbia elementi significativi e corroborati da letteratura scientifica di riferimento ad inviarli per il tramite delle segreterie delle società scientifiche del Collegio Agorà, Sies, Sime al fine di poterne valutare l'integrazione.

Questo documento potrà risultare inoltre utile a tutti i colleghi per divulgare informazioni corrette e referenziate per i propri pazienti al fine di trasferire una informazione corretta.

La carbossiterapia consiste nella somministrazione, per via sottocutanea, di anidride carbonica allo stato gassoso.
La carbossiterapia risulta utile nel trattamento dei disturbi caratterizzati da un'alterazione della microcircolazione:

1. Cellulite e adiposità localizzata
2. Striae distensae
3. Cicatrici ipertrofiche
4. Alopecia
5. Sindrome di Raynaud
6. Invecchiamento cutaneo
7. Psoriasi
8. Insufficienze venose e linfatiche
9. Ulcere delle gambe

L'anidride carbonica è infatti in grado di aumentare il flusso ematico locale mediante:

- Aumento della sfigmicità arteriolare e metarteriolare (aumento della dilatazione e ritrazione delle pareti elastiche di arteriole e metarteriole), che favorisce la spinta del sangue dal flusso ematico al microcircolo
- Rilassamento delle cellule muscolari lisce presenti a livello degli sfinteri precapillari

A livello del tessuto adiposo, l'anidride carbonica è in grado di:

- Indurre l'attivazione di una cascata che attiva la lipasi intradipocitaria (idrolisi dei trigliceridi presenti all'interno degli adipociti, con formazione di acidi grassi e glicerolo)
- Aumento della concentrazione locale di ossigeno attraverso effetto Bohr (rilascio di O2 da parte di emoglobina, in risposta alla diminuzione locale di pH e aumento della concentrazione locale di CO2): attivazione dei processi catabolici di ossidazione di acidi grassi.

La CO2 viene poi allontanata dall'organismo mediante meccanismi endogeni di eliminazione, medesimi utilizzati in condizioni fisiologiche.

Principali effetti collaterali:

- Dolore e/o fastidio durante il trattamento: l'infiltrazione sottocutanea di CO2 causa un temporaneo enfisema, che "scolla" i tessuti, provocando dolore 3/o fastidio, maggiormente percepiti quando l'inestetismo da trattare è compatto (es. cellulite con abbondante componente fibrotica)
  Enfisema: condizione caratterizzata dalla presenza, in una zona anatomica circoscritta, di una sostanza gassosa.
- Sensazione di indolenzimento cutaneo
- Comparsa di lividi nel sito di iniezione

Controindicazioni

- Insufficienza respiratoria cronica
- Insufficienza renale ed epatica (per eliminazione CO2)
- Patologie cardiache
- Diabete
- Anemia grave
- Gravidanza
- Terapia farmacologica con inibitori dell'anidrasi carbonica

Embolia da CO2

Per embolia si intende l'occlusione del lume di un vaso sanguigno da parte di una bolla gassosa o di un liquido non miscibile con il sangue o di un coagulo, traportati dalla corrente sanguigna.
L'embolia è un effetto collaterale **della chirurgia laparoscopica**, che si verifica generalmente a seguito dell'errato posizionamento dell'ago di Veress in un organo o grande vaso.
L' embolia da CO2 è MOLTO rara: uno studio analizzato del 2022 riporta una meta-analisi riporta un'incidenza di 7 su 489335 laparoscopie.

Perché la carbossiterapia impiegata in medicina estetica non può causare embolia?

1. Sito di iniezione: la somministrazione di CO2 avviene a livello sottocutaneo. NON si tratta di una tecnica di natura chirurgica
2. Velocità di flusso: introduzione di **10 L/minute** con mantenimento di **3/4 L/min** in laparoscopia rispetto al flusso di 200-600 mL/minute (mediamente quindi il 4% rispetto ad una laparascopia) ed un quantitativo complessivo medio fino a 2 L impiegato in Medicina Estetica (variabile a seconda del trattamento e del protocollo impiegato)

LA CARBOSSITERAPIA DEVE ESSERE ESEGUITA PREVIA VISITA MEDICA ESEGUITA ESCLUSIVAMENTE DA PERSONALE MEDICO ESPERTO, CON L'AUSILIO DI UN DISPOSITIVO MEDICO ELETTROMEDICALE DOTATO DELLE IDONEE CERTIFICAZIONI, ALL'INTERNO DI UNO STUDIO MEDICO / STRUTTURA SANITARIA

Segue nelle pagine seguenti una analisi della letteratura scientifica di riferimento.

Analisi preliminare letteratura Carbossiterapia in Medicina Estetica

Pianez LR, Custòdio FS, Guidi RM, de Freitas JN, Sant'Ana E. Effectiveness of carboxytherapy in the treatment of cellulite in healthy women: a pilot study. Clin Cosmet Investif Dermatol. 2016 Aug;9:183-90

EFFECTIVENESS OF CARBOXYTHERAPY IN THE TREATMENT OF CELLULITE IN HEALTHY WOMEN: A PILOT STUDY

Study Purpose: To investigate the effectiveness of carboxytherapy in the treatment of cellulite in the areas of buttocks and posterior thigh.

Efficacy: No significant changes in the body weight or BMI. Photographic images captured in a standardized manner were analyzed by three independent evaluators and were partially blind: **the visual inspection of photographic records of the areas treated with carboxytherapy showed statistically significant (P=0.0025) changes regarding the aspect of improvement of the degree of severity. All volunteers showed improvement of skin appearance after carboxytherapy sessions,** suggesting decreased tensile forces on the skin and possible redistribution of vertical forces (vector forces) in the septum.

Safety: Important studies report that the use of CO2 for contrast angiography attests to the safety of this gas and have shown that **it is not likely to promote clots. CO2 can be used with intravascular bolus injections of up to 100 mL and continuous flows between 20 and 30 mL/s without adverse reactions**. In this study, 80 sessions with carboxytherapy were performed and no volunteer had any sort of significant adverse effects, but reported only mild transient discomfort, tolerable during treatment. One volunteer had two small bruises that resolved spontaneously, which suggests that carboxytherapy can be a safe technique. The treatment was tolerable for all the patients.

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Domingos Oliveira SM, Rocha LB, de Cunha MTR, Mauad Cintra MM, Pinheiro NM, Mendonca AC. Effects of carboxytherapy on skin laxity. J Cosmet Dermatol. 202 Nov;19(11):3007-3013

EFFECTS OF CARBOXYTHERAPY ON SKIN LAXITY

Study Purpose: To evaluate the effects of carboxytherapy upon human skin collagen and elastic fiber synthesis.

Efficacy: five volunteers with skin phototype III showed improvement in collagen fibers. The first volunteer presented an average of 33.39% of collagen fibers, and later in the treatment, the average was 45.41%; the second one, the improvement was from 38.45% to 43.77%, a third one from 36.72% to 41.37%, a fourth one from 40.29% to 44.18%, and a fifth one, with a slight improvement, from 42.65% to 44%. One volunteer with skin phototype II initially presented 38.71% of collagen fibers and after the application presented 43.63%. Two volunteers with skin phototype V also had a significant improvement with an initial average from 34.19% and 30.96% to 45.58 and 36.51%, respectively. Out of the nine volunteers, only one with skin phototype III did not respond well to carboxytherapy treatment. **Histological**

findings demonstrated an increase in collagen synthesis and elastic fibers in the treated groups compared with the control group. The morphometry showed a significant increase in the percentage of collagen in the group treated with Carboxytherapy (41.44 ± 4.50%) compared to the control (37.44 ± 3.87%) with P = .04. The morphometric analysis of the percentage of elastic fibers showed no significant difference between the control group (10.55 ± 4.33%) and the one treated with carboxytherapy (10.44 ± 3.71%).

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lam M, Sadhwani D, Geisler A, Aslam I, Makin IRS, Schlessinger DI, Disphanurat W, Pongprutthipan M, Voravutinon N, Weil A, Chen BR, West DP, Veledar E, Poon E. Subcutaneous infiltration of carbon dioxide (carboxytherapy) for abdominal fat reduction: a randomized clinical trial. J Am Acad Dermatol. 2018 Aug; 79(2):320-326

SUBCUTANEOUS INFILTRATION OF CARBON DIOXIDE (CARBOXYTHERAPY) FOR ABDOMINAL FAT REDUCTION: A RANDOMIZED CLINICAL TRIAL

Study Purpose: To assess the extent to which carboxytherapy, the insufflation of carbon results in reduction of fat volume.

Efficacy: Ultrasound measurements of subcutaneous fat thickness indicated **significantly less fat in the flanks treated with carboxytherapy versus sham one week after the last treatment** (anterior location, p=0.004; across all locations, p=0.011). **Total circumference decreased nominally** but not significantly at Week 5 compared to 263 baseline (p=0.0697) and from baseline compared to Week 28 (p=0.612). Weight did not significantly change over the study (p=1.00).

Safety: Two out of the four subjects who 250 withdrew complained of discomfort associated with carboxytherapy, but no serious adverse events were observed or reported.

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El-Domyati M, El-Din WH, Medhat W, Ibrahim MR, Khaled Y, Carboxytherapy for stria distensae: a promising modality. J Cosmet Dermatol. 2020 Nov;20(2):546-53

CARBOXYTHERAPY FOR STRIAE DISTENSAE: A PROMISING MODALITY
Study Purpose: To objectively evaluate the use and effectiveness of CDT for treatment of SD.

Efficacy: **Clinical improvement in length, width, texture, as well as pigment changes, was**
strikingly observed after treatment with CDT. Meanwhile, the percent of improvement observed by 3D camera were significantly correlated to the clinical findings (P=0.04).

Safety: **Apart from temporary erythema, hotness and bulging of the treated site that showed complete resolution, within one hour, no other potential adverse**

effects or complications were encountered. There was mild tolerable pain during injection in all patients.
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Analisi preliminare letteratura Carbossiterapia
Branche correlate alla Medicina Estetica

Doghaim NN, El-Tatawy RA, El-Hamd Neinaa YM, El-Samd MMA. Study of the efficacy of carboxytherapy in alopecia. J Cosmet Dermatol. 2018 Dec;17(6);1275-85

STUDY OF THE EFFICACY OF CARBOXYTHERAPY IN ALOPECIA

Study Purpose: To evaluate the clinical efficacy and safety of carboxytherapy in alopecia areata and androgenetic alopecia.

Efficacy: **Group IA patients showed statistically significant clinical improvement in SALT score after last session of carboxytherapy and at the end of follow-up period in comparison with that before treatment with P value <.05. Group IIA patients reported variable degrees of clinical improvement after carboxytherapy in 100% of patients** with 50% of them showed very good response (A3) and 30% excellent response (A4). While, at the end of follow-up period, 30% of patients showed very good response (A3) and only 10% showed excellent response (A4). Significant clinical improvement was observed in group IIA patients after carboxytherapy in comparison with that before treatment.

Safety: All the studied patients in both groups tolerated the procedure well. The reported side effects of carboxytherapy in group IA and IIA were minimal and transient in the form of **minor pain, burning sensation, erythema, and edema at site of injection that disappeared spontaneously within 10-15 minutes. No history of hematoma or ecchymosis was reported**. However, 2 AA patients and eight AGA patients reported **headache that resolved spontaneously in <24 hours.** Females were less tolerable to carboxytherapy than males. Generally, patients with AGA complained headache more than patients with AA.

Ulteriori riferimenti
Fukaya E, Hopf HW. HBO and gas embolism. Neurol Res. 2007 Mar;29(2):142-5. doi: 10.1179/016164107X174165. PMID: 17439698.