

Carboxitherapy

Gustavo Leibaschoff, MD

Director of the International School of Carboxitherapy

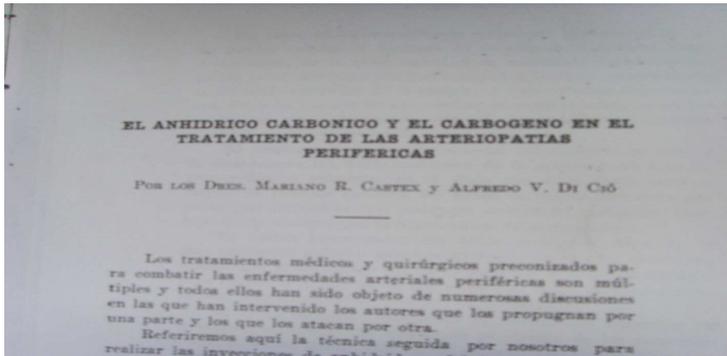
www.internationalschoolofcarboxitherapy.com

info@internationalschoolofcarboxitherapy.com

CARBOXITHERAPY CONSISTS IN THE THERAPEUTIC USE OF CARBON DIOXIDE (CO₂) IN ITS GASEOUS STATE, EITHER TRANSCUTANEOUS OR BY SUBCUTANEOUS INJECTION.

CARBODIOXIDETHERAPY (CDT) IS THE ADMINISTRATION SUBCUTANEOUSLY OF THE GAS.

This therapy was first performed in Argentina(1) and in France, in the thermal waters station of Royat, near Clermont Ferrand.(2) There a group of cardiologists from the hospital of Clermont Ferrand, began to treat patients with peripheral organic and functional arteriopathies (atherosclerotic, Buerger's disease, Raynaud's disease, etc). In 1953 the cardiologist Jean Baptiste Romuef, published a paper about his 20 years of experience with the subcutaneous injection of CO₂.(3) Afterwards, the Parisian cardiologist Jerome Berthier, along with Luigi Parassoni from Gaillard A, started its application on patients with cellulite.(4)



First paper about the use of CDT publish in the Journal of the Argentine Medical Association (1934)

Up to 1983 402,000 patients had been treated in Royat. By 1994, 20,000 patients were treated per year. This number of patients confirms the popularity and perhaps the efficacy of this therapeutic method.

Carbon dioxide (CO₂) is an odorless colorless gas first discovered by Van Helmont, in 1648. The clinical use of CO₂ is not new. Many years ago, in France, Clermont Ferrand used thermal CO₂ (CO₂ 99.4%, N 0.558%, O₂ 0.021%, plus argon, xenon, and krypton traces) for treating lower limb peripheral arteriopathies, especially the obliterating ones.(5)

When administered sub-cutaneously, CO₂ immediately diffuses at the coetaneous and muscular microcirculatory level.

After the administration of 200 cc of CO₂ in the canine thigh subcutaneous tissue, CO₂ is detected in femoral venous blood in

approximately 5 minutes, with a maximum time lag of 30 minutes. This demonstrates the ability of CO₂ to diffuse across fasciae, and reach the underlying muscles.(6)

Most of the gas is eliminated through the lungs (expiration), while a smaller portion is converted into carbonic acid in tissues and eliminated through the kidneys.

At the vascular level, CO₂ increases vascular tone and produces active microcirculatory vasodilatation. CO₂ - induced vasodilatation results from its direct activity on arteriole smooth muscle cells.(7)

In addition, this promotes Bohr's effect, a mechanism that allows tissue CO₂ transfer to lungs and lung O₂ transfer to tissues through the oxy-hemoglobin dissociation curve. When administered through an external route, CO₂ promotes this mechanism, resulting in a higher tissue oxygenation and neoangiogenesis.

Although it is toxic when inhaled (10% in air may cause asphyxia),

Subcutaneous or intra-abdominal administration of CO₂ has not shown any toxic effects, even at high doses (2-10 liters).

Pharmacodynamics

- Active vasodilatation
 - ▮ Direct activity on arteriolar smooth muscle fiber
 - ▮ Sympathicolytic activity
-

- Increase in arterio-arteriolar sphygmicity
- Increase of oxidative phenomena, with the resulting hydrolysis of triglycerides into fatty acid in the adipose tissue
- Haemorheologic activity
- ▯ Improves erythrocyte deformation

INDICATIONS

Cosmetic medicine

- Cellulite PEFE (8)
- Localized adiposity
- Skin laxity
- Aging skin of the face (22-23)
- Stretch marks (estriae)

Cosmetic Surgery

- Pre & post Lipo
- Complications of Lipo

Angiology

- Organic and functional artheriopathies
- Microangiopathies (Atherosclerosis, Diabetic)

Urology

Erectile dysfunction

Dermatology

Psoriasis

Phlebology

Ulcers



Before and after with CO₂, twice a week plus mesotherapy, look the surface of the skin

COSMETIC SURGERY

In this case I use CO2 three week before the liposculpture and continue the treatment 10 days after the surgery, during two month, twice a week (Pre and post liposculpture)(9)



According to the most recent studies, the cellulite has its origins in the ECM (extracellular matrix) and in the microcirculatory alterations, the network of diminutive arteries, veins and lymphatics that crosses the connective.

If this microcirculatory system starts failing, the tissue is not fed efficiently.

The substances start accumulating and forming edemas, nodules, and skin retractions.

The CO2 reverts this situation when injected in the affected zones through a very thin needle (27 G)

It produces vasodilatation (10)

Improves the speed of the microcirculation(increase flowmotion),
The tissue receive more oxygen and the toxins are eliminated,

The edema is reduced.

It also favors the lipolysis (reduce the size of the fat cells), and the lipoclasia (the destruction of the fat cells).(13)

Another interesting fact is that Carboxitherapy provides excellent results for patients with long time cellulite

It also provides great results to young patients as a prevention method.

Lipodystrophy and cellulite are pathologies in which microcirculatory disorders resulting in interstitial edema constitute triggering factors that also support the pathological process. Since subcutaneous CO₂ improves capillary blood flow and reduces stasis, carboxytherapy contributes to the restoration of microvascular-tissue unit exchanges.

Administrated through subcutaneous route, CO₂ causes subcutaneous microcirculation vasodilatation expressed in an increase of blood flow and the opening of “virtual” capillaries that normally are closed. This seems to occur from dilatation of arteriole smooth muscle cells.(12) with an increase in tissue PO₂ that is maintained for a certain post-therapy period.(13)

In the case of cellulite and lipolymphoedema, carboxytherapy shows an effective activity. Cellulite and lipolymphoedema show

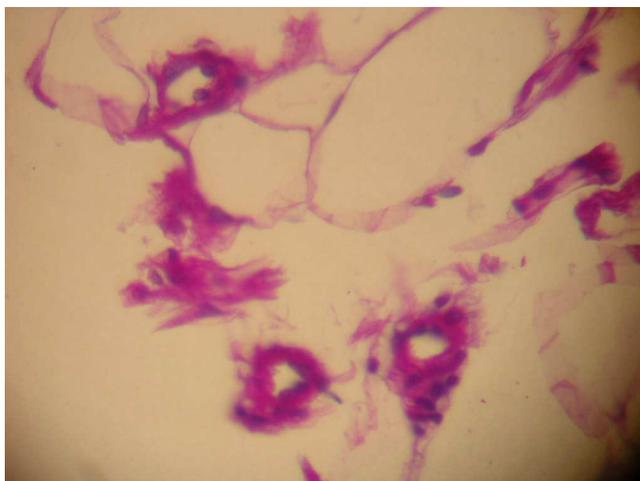
microvascular alterations (stasis micro-angiopathy) and histomorphological disorders (adipocyte aggregation and fibrosis).

Carboxitherapy technique produces a lipolysis action by increasing the blood flow in pre-capillary arterioles and also by stimulating the fat cell's beta1-2 adreno-receptors (24)

The concept of localized adiposity is often misunderstood.

Histological studies showed hypertrophic fat cells (larger size) , hyperplasy fat cells (larger number) and always a microcirculatory and lymphatic alteration is reported.

This is why CDT is suggested as an initial treatment in the Localized Obesity, because it will improve the microcirculation and the lymphatic system helping in that way to eliminate the metabolites of the fat cells



The sections show subcutaneous cell tissue with varying degrees of mucinosis, interstitial edema, and proliferation of blood and lymphatic vessels with varying degrees of microangiopathies (grade 1 and 2, according to Handelsman). There is fibrous thickening of the interlobar connective septa and inflammatory perivascular and interstitial infiltrates. (25)

Diagnosis: Edematous-fibrosclerotic panniculopathy (cellulite)

This was also evident in treatments for systemic multiple lipomatosis in which, in combination with surgery, a reduction in adipose masses was observed. Hence, it is evident that carboxitherapy has good results both in terms of clinical manifestations and histology.(14)

Treatment Method

EQUIPMENT

Allows CO₂ administration in a controlled manner: flow velocity, injection time, total volume and monitoring of administration dose percentage.

The gas in the canister is administered in sterile conditions, in very low pressure.



Inject the gas through a state of the art computerized unit at a constant pressure and volume in a period of time; also allow a perfect control of the amount of gas, from 1cc to 100cc.

CO₂ is applied in the subcutaneous through a small needle, very fine. (27G, 30G) and in a different depth accord the aesthetic pathology

1mm

In stretch marks, laxity in the face and neck,

2mm

Detachment in the face and neck (for example in deep nasolabio fold)

4mm

Laxity in the body, and in the treatment of cellulite

8-10mm

Subcutaneous administration in localized adiposity

The goal for the successfully subcutaneous application of CO₂ are inject in different planes, superficial (1 mm) medium (3-4 mm) for collagen stimulation and more uniform surface, and subdermal inside the fat deposit (6-10mm) for lipolysis.

The carboxitherapy (CDT) effects start in the microcirculation and can be observed through a Videocapilaroscopy(VCP), allowing doctors to demonstrate the action of the technique before results are visualized on the surface .(15)

Until now, the absence of clinical parameters and instruments, for the semiologic characterization and differential diagnosis limited treatment investigation to inspection and palpation.

With the VCP we can see the changes at microcirculatory level and know if we are making the right treatment.

VCP is a non-invasive method that analyzes capillaries through static and dynamic images. (16)

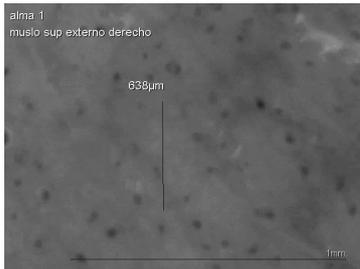
Also, the VCP allows the observation of:

- morphology of vascular micro architecture
- morphology of capillaries
- degree of capillary filling
- type of capillary flow (color)
- assessment of an increase in vascularization
- increase in capillary density
- morphology of the venular system.

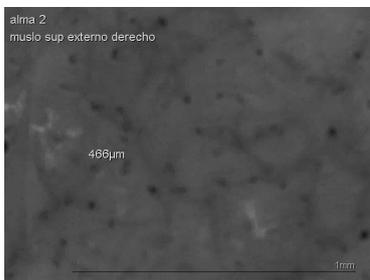
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One of the most scientific classifications of cellulite was made for the Plastic and Reconstructive Surgery Cathedra of the University of Sienna, headed by the Dr. Prof. D'Aniello. They use the clinical, the videocapillaroscopy (VCP), the laser fluxometry and the histopathology allow diagnostic classification.

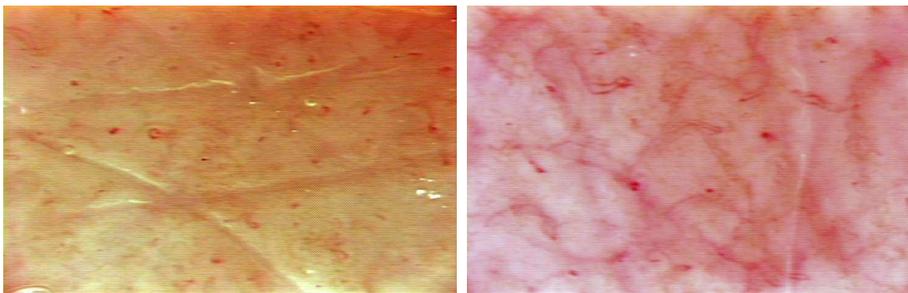
This linkage of the morphologic and biologic, allows us also to evaluate evolutionary purposes and prognoses.



Videocapillaroscopy before the use of CO₂



After administration of subcutaneous CO₂, there is an increase in vertical capillaries (black points) and transverse capillaries.



Before CO₂, less number of vertical capillaries (VC), After increase the number of VC and the color look more pink (increase of microcirculation)



The Scalar VL-7EX video visualization systems enhance skin analysis.

A complete system consists of a probe, a lens, a power supply, and a monitor. The hand-held probe is comfortable and lightweight. Lenses are easily installed and switched. The VL-7EX features freeze-frame capability.

The VL-7EX video microscope is a high quality, low cost, light weight, and hand-held electronic imaging system. Video microscopy allows the medical professional to perform evaluations of skin conditions "live"(microcirculation), while patients view their condition on the screen as the analysis is being performed. With the VL-7EX video microscope, one can see both the surface and sub-surface details in high resolution on a full-color video monitor display.

When used by aesthetic physicians, the Scalar VL-7EX video microscope enhances the client's understanding of the specific characteristics of the microcirculation and features of their skin.

Scalar VL-7EX video microscopes add efficiency and depth to analyses of skin (microcirculation). Effective treatment and services performed can be verified with before-and-after comparisons that are achieved by archiving video images to printers or VCRs attached to the instruments.

Gustavo Leibaschoff, MD Cosmetic Surgeon Luis Coll, MD (University Dermatologist UBA) development an study about the Cellulite,

Carboxitherapy (Carboxipen™)and Videocapilaroscopy in 15 patients with cellulite syndrome (EFP)

The images obtained in the prospective study by VCP showed that Immediately after the first session using carboxytherapy in different doses, 150cc and 50 cc Vertical capillaries significantly increases 35.2 +/- 3.3% per mm² in the area of injection

After a week of the Carboxitherapy session the images showed a decreased of 8.2% of vertical capillaries comparing with the previous images post injection

CONTRAINDICATIONS of CDT

Recent or acute myocardial infarction.

Inestable angina.

Congestive Heart failure

Severe High Blood Pressure.

Acute thrombophlebitis.

Gangrene.

Localized infections.

Epilepsy.

Respiratory failure.

Renal failure.

Pregnancy.

SIDE EFFECTS of CDT

Side Effects

Local Burning or oppressive pain, fleeting, at the injection site are related to flow velocity and patient's threshold.

Carboxipen™ device uses an special regulator allowing a progressive control of the flow pressure of the gas injection obtaining less side effects

Limb heaviness sensation (no longer than 2 hs), is related to dose (more than 300cc in each limb)

Rubor at the injection site, during 30 minutes

Echymosis.(try to avoid vessels and varicose veins)

Subcutaneous crepitation, of variable duration (no longer than 30 minutes)

PROTOCOL IN CELLULITE

Subcutaneous injection using volumes between 100 – 200 cc per limb. Initial flow may vary between 10 – 50 cc/ min. (17)

It is advisable to make punctures in different directions (downward-upward and upward-downward) with a 27 G or 30 G needle.

Divide the area into 4 to 6 quadrants per limb (look the diagram below)

The first session is suggested to inject no more of 10-20cc per quadrant and then in the following sessions increase up to 50 cc per quadrant.

Accompany with manual massage (move fingers as in piano playing over subcutaneous emphysema areas) in order to contribute to gas diffusion, to control emphysema and to reduce patient's possible discomfort.

Frequency of sessions

On a daily basis

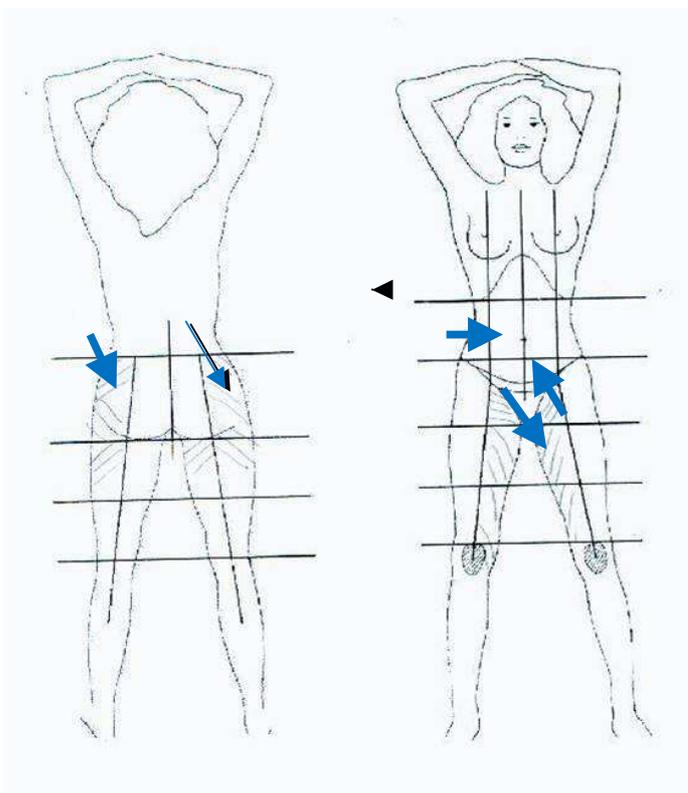
Ideal for patients staying at thermal centers or patients receiving one-week treatment. Generally, two or three cycles per year are suggested.

Two or three sessions per week

It is the more widespread frequency and the most recommended, particularly if symptoms and an important microcirculatory stasis are present. Also used for achieving lipolytic effects (to reduce localized obesities).

One session per week

An alternative for patients with aesthetic problems, showing no symptoms. At least, 15 sessions should be performed.



In each quadrant inject 50 cc (follow blue arrow)



before liposculpture



After Liposuction and after. 20 sessions of CO2 300cc each leg.

CDT its use in the facial treatment as well, in the laxity of the skin, in the periocular area for decrease the dark circles, increase the firmness of the skin and reduce the hyperpigmentation.

In the skin rejuvenation before the mesotherapy CDT increase the aesthetic results.

For a full Facial treatment, the total of CO₂ is around 10cc

In the Forehead several punctures (6-8), weekly, 1mm depth, 1cc of CO₂

In the temporal and preauricular area (close to the hair line) one puncture in each area, weekly, 1 mm depth, 1 cc of CO₂

Over the Crown's feet one puncture in each small line, weekly, 1 mm depth, 1 cc of CO₂

In the Superior eyelid, one puncture, monthly, 2mm depth for detach, 1-2 cc of CO₂. The same for the inferior eyelid

Over the Nasogenian fold first one puncture monthly. 2 mm depth for detach, 1 cc of CO₂ and 2 superficial puncture, 1 mm depth in the line of the nasogenian fold, monthly, 1cc of CO₂ each

In the Neck, if there are only laxity of the skin, three punctures, one below lateral jaw angle (both sides) , one below the chin, 2mm depth

for detach, 1-2 cc of CO₂ in each puncture each 15 days. With localized obesity in the neck, a subcutaneous puncture 6mm depth, below the chin, 5-10 cc of CO₂ each 15 days.

For the revitalization of the Chest, several punctures (6 to 8) with a regular distribution, 1 mm depth, 1cc of CO₂, weekly .

The eyelid treatment with Carboxitherapy used once weekly typically begin to show an improvement in eyelid pigmentation after one to three weeks, the texture after two to four weeks and the eyelid contour in 3 to five weeks.

When carboxitherapy is performed less frequently the results occur more gradually.

The treatments continue for 2/3 months and need to be repeated after 6/12 months depending the case. (22)

The technique of Marian Zilkha, MD, N.York used some times several sessions in the same week

CO₂ insufflation for periorbital skin rejuvenation



- Courtesy of Marian Zilkha, MD.
- Intradermal, daily for a week, multiple puncture



Courtesy of Marian Zilkha, MD

Once a week 6 sessions

Stretch Marks

The first results with the use of CDT are seen after a few sessions

(21). The quality of the skin is important in the treatment of the stretch marks. Will be have a better result if there are a soft skin texture, a good firmness of the skin and a homogeneous color of the stretch marks (more pink).

One session each 15 days during 3- 4 month

The technique is a combination of a single deep puncture (6mm) injecting CO2 200cc and multiples superficial (1 mm) punctures injecting CO2 5 cc in each stretch mark path.

CONCLUSIONS

It's a useful tool for the treatment of Cellulite, Localized adiposities, Stretch marks, skin laxity etc.

Easy application with no significant or adverse side effects

Possible association to other types of procedure (Mesotherapy, radiofrequency etc)

Device: It's important to have a device that allows a progressive control of the flow, slow or fast, small or larger amount of gas (1cc to 100cc) according to treatment needs. These are the conditions to obtain a painless application

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