THE MEDICAL FACE LIFTING: REGENERATION OF THE FACE TISSUES

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The aging determines to level of the face a reduction of the tissues volume and the tissues consistence that determines a fall of these for gravity and a consequent skin blemish.

The bony tissue of the skull regresses decreasing its volume. This brings to the reduction of the support plans for the soft tissues that cover the bone with consequent flabbiness and folds and wrinkles formation. The muscular tissue regresses equally, even if this regression doesn’t determine an important aesthetical problem. The adipose tissue loses its consistence and its volume with emptying of the face and low sliding of the cutaneous tissue. Finally, also the dermis loses its turgidity both for water loss and for thickness matrix reduction.

All this shows, aesthetically, as a face aging.

The cosmetic surgery, with the face lifting intervention, removes a portion of the tissue to bring the same to an extended state. It’s obvious that this is not a physiological intervention, but only an aesthetical correction. The tissues are damaged and the same intervention, with the fibrosis induction, worsens the microcirculation and grows old anymore, biologically, the tissues. We have a young face aesthetically but old biologically.

The medical intervention, worries instead about to regenerate the altered tissues bringing them to the initial aspect and inducing a true biological rejuvenation. The scientific rational of this treatment belongs to the Regenerative Medicine, a new medical branch, derived by the Physiological Medicine.

The Physiological Medicine, in fact, remembers that the medical interventions must support the wellness and not to correct the illness. Therefore, also in the aesthetical correction concept, we must use the last biological know ledges of the tissues regeneration to bring these, as far as possible, to their initial state.

The regeneration of the tissues of the face is defined with the term of Medical Face Lifting.

The Medical Face Lifting foresees:

- The regeneration of the cutaneous dermis
- The regeneration of the zygomatic bone
- The regeneration of the face fat tissue

**Regeneration of the cutaneous dermis**

This intervention uses the biostimulation of the dermo-epidermal cells with the platelet derived growth factors. Technique debugging in 2003 from the Prof. J. Víctor García of the Universitat Autònoma de Barcelona in Spain and today diffused over the entire world for the important clinics answers that achieve to the treatment.
Recent scientific studies have reviewed the platelet derived growth factors biostimulation protocol.

The study, conducted by the Prof. Victor Garcia and from the Prof. Maurizio Ceccarelli is started from some considerations:

- How much PDGF is freed, in a normal plasma (not concentrated), after the platelets activation and this quantity is enough or no to stimulate the fibroblast receptors?

A job published on Blood in August of 1984 tells us that:

- the PDGF concentration, powerful mitogen of the connective cells, in a healthy human serum, after the platelets degranulation, is of around 20 ng/mls and that the PDGF half life is very short, around 2 minutes.

A job published on J.Biol Chem. in July of 2008 tells us that:

- Already with only 5 ng/mls we have a strong induction to the fibroblast proliferation.

Of particular interest is the 2008 job published on Communicativeness & Integrative Biology where we read that:

- after 6-8 hours from a fibroblast stimulation with PDGF we have a tirosin-kinasi receptors recruitment on the cellular surface and a second stimulation with greater PDGF concentration induces an answer more important.

Reassuming:

- The PDGF acts to small concentrations: 1-2 ng/mls
- In the platelets degranulation we free around 20 ng/mls of PDGF.
- The PDGF has a very short half life: minutes.
- After 8 hours from a first biostimulation we have an increase of tirosin-kinasi receptors. Then, a second stimulation induces a greater answer of the connective cells.

To this point, calculated the quantity of plasma PDGF normally freed we must verify that the number of molecules corresponding to this quantity is enough to tie themselves to the fibroblast tirosin-kinasi receptors.

For this, we develop the followings calculations:

- In the platelets degranulation we have around 20 ng/mls of PDGF that correspond to \(20 \times 10^{-9}\) g/mls;
- To get the number of correspondent moles we have to divide the grams for the Molecular Weight of the substance;
- The PDGF Molecular Weight is 300,000 (3 \( \times 10^5\));
- We divide the grams for the MW (\(20 \times 10^{-9} : 300,000\)) and we have \(6 \times 10^{14}\) moles;
- The molecules number present in a mole of substance is express from the Avogadro’s number (\(6 \times 10^{23}\));
- Multiplying this number for the freed PDGF moles number we get the value of \(36 \times 10^6\) molecules.

In our biostimulation intervention we normally treat face and neck.

We develop the middle volume of these zones multiplying a surface of 30 for 20 centimeters for a thickness of 2 millimeters (dermis). We get the value of \(12 \times 10^{12}\) micron\(^3\).

Now, considering that a cell has a middle volume of 100 micron\(^3\) and considering that the fibroblasts represent 1% some whole dermis volume, we can calculate the fibroblasts number presents in our treatment volume.

Then, dividing the total volume (\(12 \times 10^{12}\) micron\(^3\)) for the cellular volume (100 micron\(^3\)) and for 100 (1%) we have a number of fibroblasts equal to: \(12 \times 10^8\).

We, now, have to calculate if the PDGF molecules to our disposition can activate the calculated fibroblasts. We divide, therefore, the PDGF molecules for the fibroblast number:

\(36 \times 10^6\) molecules: \(12 \times 10^8\) fibroblasts

We get 30 molecules for fibroblast for every injected plasma milliliter. Since we inject, on average, 5 mls for biostimulation session, we get: 50 PDGF molecules for fibroblast.

But how many receptors are present on the fibroblast cellular wall?

We know that the surface cellular molecules (cluster of differentiation) have been listed, to everything today, in 350 different types (International Workshop and Conference on Human Leukocyte Differentiation Antigens) and that the various CD are assembled in receptors families. The CD that we stimulate with the PDGF are the tirosin-kinasi receptors, one of the subfamilies.

 Particularly we classify:

1. Intracellular receptors and transmembrane receptors.
2. The transmembrane receptors are divided in metabolotropics and ionotropics.
3. The metabolotropics receptors are divided in:
   - Receptors connected to the proteins G
   - Kinasi coupled receptors
   - Guaniato-ciclasis receptors
   - Tirosin-kinasi receptors

Every family and subfamily has numerous receptor types for a general total of 350.

It’s obvious that not all the cells (in this case the fibroblasts) have all the membrane receptors families.
We suppose that the fibroblast can have 10-20 different types of receptors and that one than these is a tirosin-kinasi receptor.
We can divide the general number of receptors (350) for 10 or for 20. We get a number of 35 or 18 receptors for every type and therefore a maximum of 35 tirosin-kinasi receptors for fibroblast.
35 receptors that we can stimulate with ... 150 PDGF molecules!!
All this confirms us the uselessness to concentrate the plasma for stimulate a normal number fibroblasts.
Different it is the discourse if we want to effect a second stimulation, distance of 6-8 hours from the before. As we have seen, a normal PDGF concentration activates the fibroblast metabolism and induces a recruitment (increase of number) of receptors within 6-8 hours. The fibroblasts with a greater receptors number can subsequently be stimulated with a greater PDGF concentration. (> 30 ng/mls).

Therefore, today we propose a variation of the PDGF biostimulation scheme:

1. To take a blood sample according to the classical scheme and with the confirmed Kit;
2. To separate the whole plasma and to mix for homogenize the platelets concentration;
3. To effect a first biostimulation on the face of the patient;
4. To wait for 6-8 hours to allow the receptor recruitment on the fibroblasts;
5. To effect a second biostimulation with Platelets Rich Plasma (third inferior of the centrifuged test-tube)

**Figure 1. 2. 3.**

**Regeneration of the zygomatic bone**

The second footstep is the bone regeneration.
The soft face tissues lean on a solid structure constituted by the head bone. Particularly the zygomatic bones hold a fundamental role in the prevention of the soft tissues downward fall. Greater is the volume of the zygomatic bones and greater is the support.
Some patients, genetically, have tall and leaning cheekbones, this allows them to withstand more the gravity strength that induces the fall the soft face tissues, aged.
Today we can help the patients with scarce cheekbones volume to increase this volume with an autologus osteoprotesis.
We intervene using the Platelets Poor Plasma, residual from the second biostimulation (you see above) and uniting it to a biologic material compatible with the bony tissue. The biomaterial that we use is the Tricalcic Phosphate pulverized in 30 micron micro granules in sterile vials of 0.5 gr.
The suspension is prepared mixing the Tricalcic Phosphate to the Platelets Poor Plasma in a 20% concentration.
Once We have prepared the suspension, this is homogenized for continuous inversion of the syringe.
The syringe is set in a bain marie, for plasmatic proteins coagulating with the heat (formation of the Autologus Biological Tissue Support - STBA). We get so a syringe of autologus proteins mixed to the Tricalcic Phosphate.
We inject the product to periosteum level in the cheekbone center.
The face of the patient is drawn with two straight lines: the first one from the nostril angle to the tragus superior border and the second from the mouth angle to the eye external. In the point of conjunction we enter with a needle, perpendicularly to the tissue, up to touch the bone. Then, we continue parallel to the bone, both to zygomatic level that to malar level.
We inject slowly taking back the needle. After we massage, to homogenize the product on the periosteaum. Within 30-40 days, the body extraneous fibrotic answer takes to the increase of cheekbone volume. The treatment can be repeated actually to aesthetical improvement.

**Figure 4.**

**Regeneration of the face adipose tissue**

The face adipose tissue regeneration follows the scheme of a technique already in use: the lipofilling. This foresees the removal a fat quantity from a peripheral body part and the filling of the same, treated or less, to face level.

The Regeneration Technique doesn't use normal adipose cells but, mainly, fat stem cells. These are sowed in small quantities for stimulating the new adipose tissue birth (Liposowing).

The fat is very rich in stem cells. A cell every 50 is a stem cell (against the bony marrow that contains every 1:10000).

The fat is so rich in stem cells because it must accumulate energy, in the necessity, also in a state of hypertrophic adiposity.

The adipocyte is able of to increase notably its volume to pick up energy in the triglycerides form. But when its volume is very elevated (superior to the 170% of the normal volume) the adipocyte stimulates the formation of new adipose tissue activating the differentiation of the stem cells presents to vascular-connective strome level.

The multiplication and the differentiation stimulus to the stem cells is mainly given by the increase of the insulin and of IG-F concentration.

The increase of the adipocyte volume over certain limits induces the dawn regulation of the insulin receptor with increase of this hormone concentration and the IG-F secretion. The stem cells, stimulated from the insulin and from the insulin growth factor, multiply themselves and are differentiated in adipoblast, preadipocyte and adipocyte.

On this base, the Liposowing foresees:

1. Stimulation of the fat donation zone with a glucose solution and insulin ready to increase the adipocyte volume.
2. Injection of 0,5 milliliters for centimeter cube of fat with a prepared solution with a insulin concentration of 1 U.I. for fat kilo to be stimulated and a concentration of glucose to 5%.
3. After 4 hours from the first infiltration it effects a second adding local anesthetic to the 1% and adrenaline.
4. At the whitened of the tissue we take the fat with 14 G needle from to allow the harvest of the strome fraction, rich in stem cells.
5. A special instrumentation can be used that allows getting fat deprived of liquid and blood (Lipivage)
6. We leave the withdrawn fat, for some minutes, in the glucose with insulin solution. Then we separate the fat from the liquid and filled its.
7. For the implant we use small cannulas (2,1 mms) or 14 G cannula needles.
8. The implant is performed in small quantities (type the Fischer's rice wheats). To facilitate the regular distribution can be done with a special gun.

The technique of the Liposowing with fat stem cells allows both a good taking root of the adipose cells and the stem cells differentiation, not only as adipocytes, but also as dermal-epidermal cells.
Concluding, the Medical Face Lifting foresees:
1. At time 0 a first dermis biostimulation with normal autologus plasma platelets growth factors.
2. After 6-8 hours a second dermis biostimulation with concentrated platelets growth (Platelets Rich Plasma) and at the same time the Bony Regeneration with STBA and Tricalcic Phosphate to 20%.
3. After 10 days from the time 0 (maximum of the angiogenesis) the Liposowing for the Adipose Tissue Regeneration.
4. After 30 days from the time 0 (maximum fibroblastic activation) a dermis biostimulation with Precursor Amminoacids and Buffer Bicarbonate (Skin-B) and an Epidermal Regeneration with topical application of autologus platelets growth factors after epidermal exfoliation (peeling). And Autologus Plasma Fibrin (PFR) infiltration under the wrinkles.
5. Control after 6 months.

Figure 9. 10.

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Figure 1. Autologus platelets derived growth factors Kit

Figure 2. Platelets Rich Plasma

Figure 3. Autologus Platelets Derived Growth Factors Biostimulation
Figure 4. Bone Regeneration with STBA and Tricalcic Phosphate

Figure 5. Gun for Liposowing. It uses 3 cc luer-look syringe and it doses from 0.5 to 0.35 cc for point

Figure 6. Suction Syringe LipiVage

Figure 7. Liposowing - Before
Figura 8. Liposowing – After

Figure 9. Medical Face Lifting – Before

Figure 10. Medical Face Lifting – After