



Biorejuvenation: theory and practice

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Abstract The aim of mesotherapy for skin rejuvenation is to increase the biosynthetic capacity of fibroblasts, inducing the reconstruction of an optimal physiologic environment, the enhancement of cell activity, and the synthesis of collagen, elastin, and hyaluronic acid. The desired final effect is a firm, bright, and moisturized skin, and the injection in the superficial dermis of suitable products—perfectly biocompatible and totally absorbable—can achieve these results. In addition to a daily sunscreen application and nonsmoking, mesotherapy is another antiaging strategy helping to maintain a globally firm and bright skin, protecting it from the environmental contributors to aging.

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Theory

Biorejuvenation is a common term to indicate mesotherapy for skin rejuvenation (also called *biorevitalization* or *mesolift*).

The goal of this technique is to increase the biosynthetic capacity of fibroblasts, inducing the reconstruction of an optimal physiologic environment, the enhancement of cell activity, and the synthesis of collagen, elastin, and hyaluronic acid (HA). The desired final effect is a firm, bright, and moisturized skin, and the injection in the superficial dermis of suitable products—perfectly biocompatible and totally absorbable—can achieve these results.

As the years pass, the skin undergoes clinical and histologic changes because of the intrinsic aging (chronoaging), and becomes relatively atrophic, lax, and wrinkled.¹

Chronoaging can be worsened by cumulative environmental damages, such as chronic UV exposure (photo-damage), pollution, and tobacco smoking.

UV exposure activates free radicals and matrix-degrading metalloproteinase enzymes, including collagenase.^{2,3}

On the basis of these premises, the mesotherapy technique can be performed in the following cases:

- mild to moderate chronoaging,
- mild to moderate photoaging,
- aging prevention,
- preparation to sun exposure,
- smokers.

The areas of application are face, neck, low neckline (décolleté), dorsum of hands, belly, and inner surface of arms and legs.⁴⁻⁷

Table 1 Main advantages of mesotherapy for skin rejuvenation

Easy to perform
Low pain
No necessity for skin tests
Limited side effects
No downtime or recovery time
Suitable for every skin phototype

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Table 2 Mesotherapy for skin rejuvenation: contraindications and disadvantages

Contraindications	Disadvantages
Allergy (especially to the ingredients injected)	Only for mild-moderate aging
History of hypertrophic scars	Mild erythema, slight itching/burning sensation 5 min after injections
Bleeding abnormalities and/or oral anticoagulant therapy	Small hematomas
Pregnancy/breast-feeding	Possibility of allergic reactions
Autoimmune disorders (lupus, scleroderma)	Lack of controlled clinical trials
Epilepsy	Lack of guidelines according to the evidence-based medicine
Diabetes	
<i>Herpes simplex</i> virus type 1 infections in the active phase	
Bacterial infections	
Inflammatory skin disorders	

Mesotherapy is an excellent complement to other non-surgical rejuvenating procedures. It rejuvenates the skin, making these procedures less necessary. In addition to a daily sunscreen application and nonsmoking, the mesotherapy is another antiaging technique helping to maintain a globally firm and bright skin, protecting it from the environmental contributors to aging (Table 1).

Although mesotherapy for skin rejuvenation is an easy-to-perform technique, contraindications and disadvantages are always present (Table 2).

To perform biorejuvenation, many products are available on the market; some of them contain only one active ingredient and others are cocktails of different compounds (Table 3). Recently, the issue that the injection of a composition including a single ingredient might be better than a cocktail injection has been raised: the side effects, resulting from the interactions among different ingredients, should be reduced, and the active ingredients, injected alone, should be more effective. In our opinion, this is not always the case.

Table 3 Products available in the mesotherapy for skin rejuvenation

Hyaluronic acid alone (1.35%-3%)
Hyaluronic acid 0.2%, 1%, or 3% plus other active ingredients ^a
Polynucleotide macromolecules
Organic silicium
Autologous cultured fibroblasts
Growth factors
Homeopathic products

^a Vitamins, aminoacids, minerals, coenzymes, nucleic acids, β -glucan.

**Fig. 1** Picotage technique on the face

Hyaluronic acid is a glycosaminoglycan polysaccharide synthesized by fibroblasts within the cell membrane and then released in the extracellular space.^{8,9}

Hyaluronic acid plays an important role in the hydration of the extracellular space, and it creates a matrix that supports the normal cell functions. It takes part in space filling, lubrication, wound healing, modulation of inflammatory cells, interaction with the proteoglycans of the extracellular matrix, and scavenging of free radicals.

**Fig. 2** Picotage technique on the dorsum of a hand.



Fig. 3 Horizontal linear threading on the low neckline.

One gram of HA can bind up to 6 L of water. This means that the higher the percentage of HA in a composition (milligrams of HA beads per milliliter), the higher its capacity will be to retain water. Derived either from rooster combs or from bacterial fermentation, HA has no species specificity, and the risk of a hypersensitivity reaction is so low that skin testing is unnecessary. Hyaluronic acid used in the mesotherapy is not cross-linked, it is not much stable, it is very fluid, and it has a short half-life, even shorter than the one used in fillers. When injected in combination with other active ingredients, it can stimulate its own synthesis by fibroblasts to maintain enough HA to give the skin firmness and moisturization.

In a mesotherapy cocktail, the vitamins are the most important active component.

- Vitamin A regulates the epidermis turnover, and it is an antidrying agent.
- The “vitamin B complex”—usually indicating a group of vitamins that includes vitamin B₁ (thiamine), B₂ (riboflavin), B₃ (niacin), B₅ (pantothenate), B₆ (pyridoxine), B₉ (folic acid), and B₁₂ (cyanocobalamin)—includes coenzymes involved in several metabolic processes that help the scavenging of free radicals.
- Vitamin C is a well-known antioxidant, and it induces collagen synthesis.
- Vitamin E is an antioxidant and moisturizer.
- Vitamin K has an effect on microcirculation.

Vitamin D, vitamin H (biotin), vitamin B₁₀, and vitamin I (inositol) are important also.

The amino acids build polypeptides constituting the matrix of cell architecture.

Sodium, potassium, calcium, and magnesium act as catalysts in numerous cell functions.

Coenzymes are nonproteic organic components that help the enzymes in their catalytic function. They are “activators” of biochemical reactions and help the dermis turnover.

DNA and RNA are bound to proteins, and they give information for the regulation of protein synthesis.

β -Glucan acts as a free radical scavenger.

Polynucleotidic macromolecules favor skin hydration increasing water retention; they act as scavengers of free radicals, and they enhance the physiologic activity of fibroblasts.



Fig. 4 Face: before and after.



Fig. 5 Dorsum of hands: before and after.

Organic silicium induces collagen fibril synthesis.

Cultured autologous fibroblasts can be used to replace the population of fibroblasts that is reduced as a result of aging.

Growth factors are key modulators of skin activity.

Practice¹⁰

After the obtainment of a signed informed consent, the physician will clean the skin of the patient using an antiseptic solution (alcohol free) and will perform microinjections with a 5-mL Luer-Lock syringe equipped with a 30 1/2- or 32-G, 4-mm needle or with a syringe with a skin injection therapy 2.5-mm needle or with a Meso-gun.

The injection techniques that can be performed are the following (always keeping the needle with an inclination of 45°):

- *Picotage* (Figs. 1 and 2). Performing of single punctures with the injection of one drop of the product into the superficial dermis. The injections are spaced at 2 mm, and the needle penetrates the treated area at 2 to 2.5 mm. The physician maintains a constant pressure on the plunger.
- *Cross-linking*. Performing of vertical injections, with a complete penetration of needle, followed by horizontal injections (1-cm distance between lines). The product is injected during the extraction of the needle from skin dermis. This technique is particularly useful for cheeks and low neckline in patients with a more advanced stage of chronoaging.
- *Linear threading*. Either vertical or horizontal injections are performed. Vertical injections are useful to prepare the nose-labial and glabellar wrinkles 10 to 15 days before injecting dermal fillers and botulinum toxin. Horizontal injections are useful in treating neck wrinkles (Fig. 3).

To reduce the burning sensation, the physician can apply EMLA cream or use mesotherapy products containing lidocaine chlorhydrate 1 hour before treatment. It is recommended to avoid injecting products containing vitamin C also.

After the treatment, a gentle massage with a vitamin K cream can be done. The procedure generally takes around 20 minutes, but it may vary depending on the treated area. Sun and smoking avoidance are recommended for the next 48 hours. There is no downtime or recovery time with this procedure.

Treatments should be done once every 2 weeks for 3 to 4 weeks, then once a month for 3 to 4 months. The results are maintained by touch-up treatments once or twice a year.

This protocol may vary according to the patient's age, clinical presentation at first visit, and response to initial treatments.

Typically, 2 to 3 treatments are necessary to see some results, even if the brightness is visible after the first one, due to a vascular stimulus by the microinjections. The number of treatments can vary from patient to patient and depends on the treated area and patient's expectations (Figs. 4 and 5).

It is important to remember that mesotherapy is not a filling technique, but it permits the rejuvenation of the skin by increasing its hydration and by reconstructing an optimal physiologic environment for the fibroblasts.

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