Atlas of MESOTHERAPY in Skin Rejuvenation

Edited by
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CONTENTS

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1 MESOTHERAPY IN SKIN REJUVENATION

Matilde Iorizzo, Maria Pia De Padova, and Antonella Tosti

Definition

Michel Pistor developed mesotherapy in France in 1952. The practice is well known for its use in cellulite reduction. The goal of mesotherapy in skin rejuvenation is to increase the biosynthetic capacity of fibroblasts with the reconstruction of an optimal physiological environment, enlargement of cellular activity, and production of new collagen, elastin, and hyaluronic acid, leading to increased firmness, brightness, and moisturization of the skin.

Injection into the superficial dermis of suitable products, perfectly biocompatible and totally biodegradable, can provide this.

Decreasing of wrinkles is also possible when the procedure is repeated over time.

Mesotherapy in skin rejuvenation is also known as biorejuvenation, biorevitalization, or mesolift.

Indications

Over time, the skin undergoes clinical and histological changes due to intrinsic aging (chronoaging), such as:

- alterations in skin texture and elasticity
- alterations in skin pigmentation
- alterations in subcutaneous tissue
- alterations in the vascular system

Clinically, the skin becomes relatively atrophic, lax, and wrinkled. Histologically, the epidermis becomes atrophic. Dermal features include decreased thickness, loss of elastic fibers, and a decrease in the biosynthetic capacity of fibroblasts[1]. The immune, endocrine, and neural functions of the skin also decrease with age. All these changes are genetically determined, and are therefore different in each individual.

Chronoaging can be worsened by cumulative environmental damage, such as the chronic ultraviolet (UV) light exposure (photodamage), the presence of pollutants, and smoking. The superimposed effects of photodamage on intrinsically aging skin have been termed photoaging. This is characterized by wrinkles, shallowness, laxity, mottled pigmentation, and rough textured skin. Cutaneous malignancies may be associated with photoaging. Histologically, the epidermal thickness may be increased or decreased, corresponding to areas of hyperplasia or atrophy. There is loss of polarity of epidermal cells and keratinocyte atypia. Dermal features include elastosis, degeneration of collagen, and anchoring fibrils. Blood vessels become dilated and twisted (Figures 1.1 and 1.2). UV exposure leads to the generation of free radicals and matrix-degrading metalloproteinases, including collagenase.[2,3]

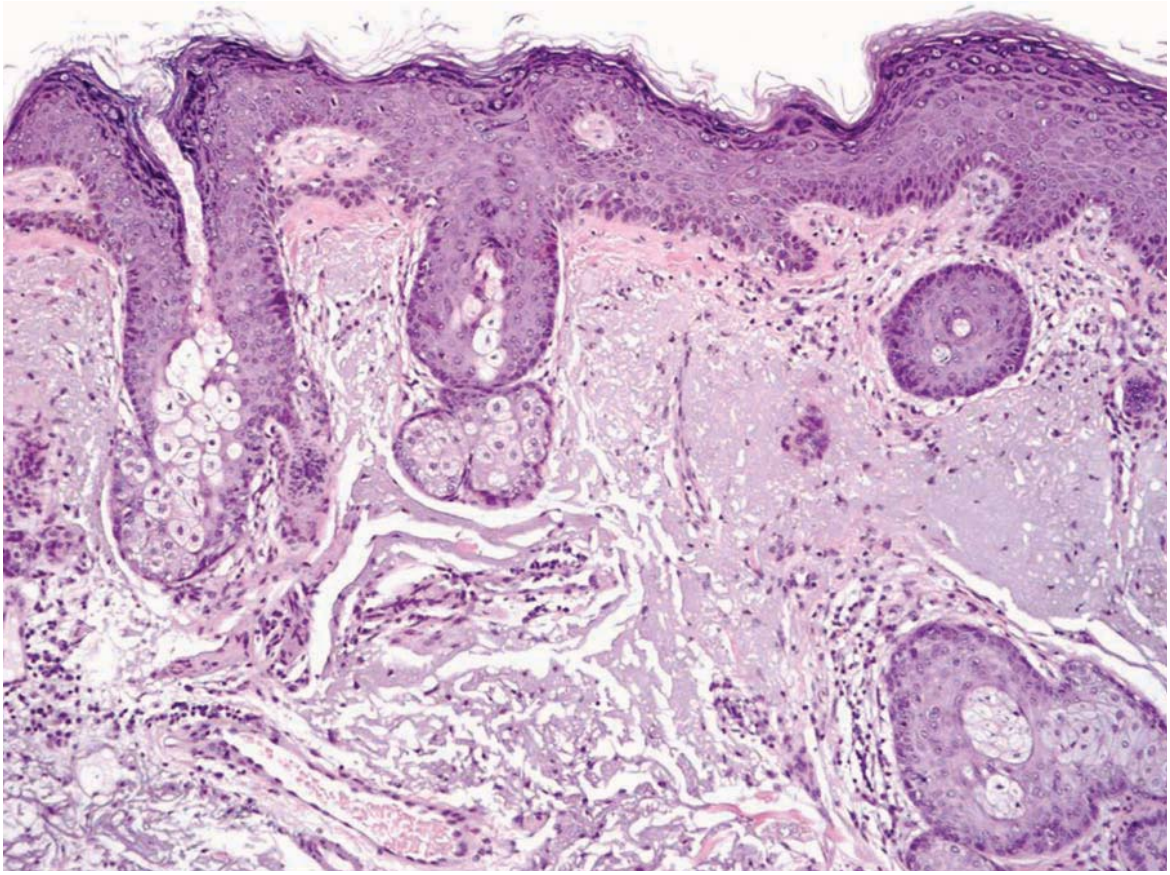

Figure 1.1 Histopathology of aged skin

Noninvasive (clinical and photographic scoring) and invasive (histological, instrumental, and biochemical tests) techniques have been proposed by several authors, with the intent of developing an objective method for evaluating all these changes.

Clinical and photographic scoring systems are the easiest to perform and the most widely utilized in clinical practice, even though they do not constitute a valid objective method.

According to Glogau,[4,5] photoaging can be classified as follows:

Type I – no wrinkles

- early photoaging
- minimal wrinkles
- mild pigmentary changes
- no keratoses
- patients between 20 and 30 years of age

Type II – wrinkles in motion

- moderate photoaging
- parallel smile lines beginning to appear lateral to the mouth

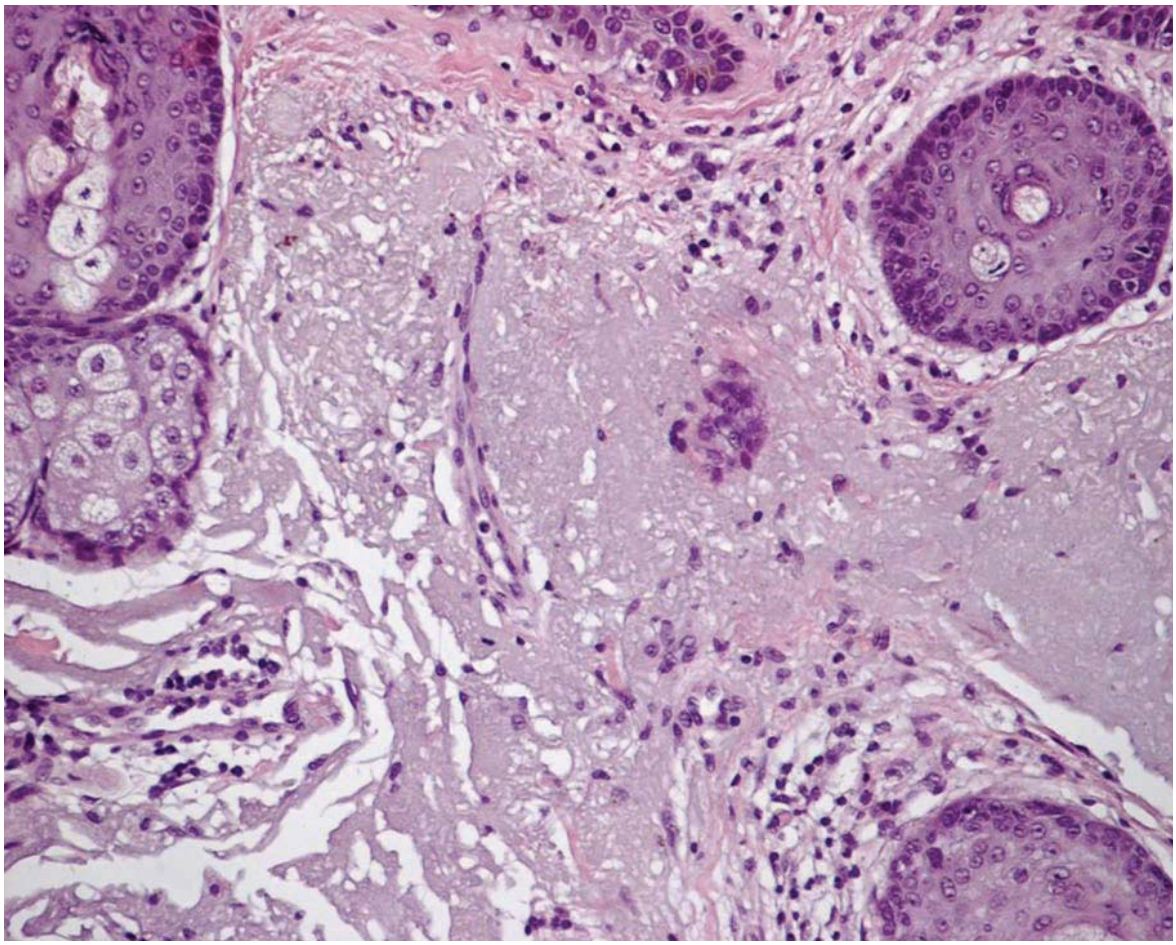

Figure 1.2 Same slide as Figure 1.1, but at a higher magnification

- early senile lentigines
- palpable but not visible keratoses
- patients between 30 and 40 years of age

Type III – wrinkles at rest

- advanced photoaging
- wrinkles even when the face is not moving
- obvious dyschromia
- visible keratoses
- telangiectasias
- patients between 50 and 60 years of age

Type IV – only wrinkles

- severe photoaging
- wrinkles throughout the face

- yellow–gray color of the skin
- signs of skin malignancies
- patients over 60 years of age

According to Rubin,[6] there are three levels of photoaging:

Level I
- wrinkles visible only when a muscle contracts
- rough, opaque, and mottled skin

Level II
- mimic wrinkles and some fine lines visible at rest
- dyscromias and senile keratoses
- telangiectasias

Level III
- deep wrinkles always visible throughout the face
- thick, yellowish, and creased skin
- senile keratoses and actinic keratoses

Le Coz[7] has instead proposed a classification of skin relaxation:

Stage I – skin relaxation visible only in certain postures (Figure 1.3)

Stage II – skin relaxation visible only on pinching (Figure 1.4)

Stage III – skin relaxation always visible (Figure 1.5)

Figure 1.3 Skin relaxation stage I

Figure 1.4 Skin relaxation stage II

Figure 1.5 Skin relaxation stage III

Given these premises, mesotherapy can be performed for:

- chronoaging: mild–moderate (Glogau I/II; Rubin I/II; Le Coz I/II)
- photoaging: mild–moderate (Glogau I/II; Rubin I/II)
- prevention of aging
- preparation for sun exposure
- smokers

Areas of application[8–11]

- Face (cheeks, chin, forehead)
- Neck
- Low neckline
- Back of hands
- Abdomen
- Arms and legs (inner surfaces)

Contraindications

- Allergy (especially to the injection ingredients)
- History of hypertrophic scars
- Bleeding abnormalities and/or oral anticoagulant therapy
- Pregnancy/breastfeeding
- Autoimmune disorders (lupus, scleroderma)
- Epilepsy
- Diabetes
- Herpes simplex virus type 1 (HSV-1) infections in active phase (see below)
- Bacterial infections
- Inflammatory skin disorders (acute phase)

Note: HSV-1 infections are a contraindication if present in the active phase. In order to avoid recurrences in those patients suffering from cold sores, oral prophylaxis with valacyclovir is mandatory (500 mg twice daily for 5 days). A single dose of famciclovir (1500 mg) can also be used.

Advantages

- Good for mild–moderate aging (Figures 1.6 and 1.7)
- Easy to perform

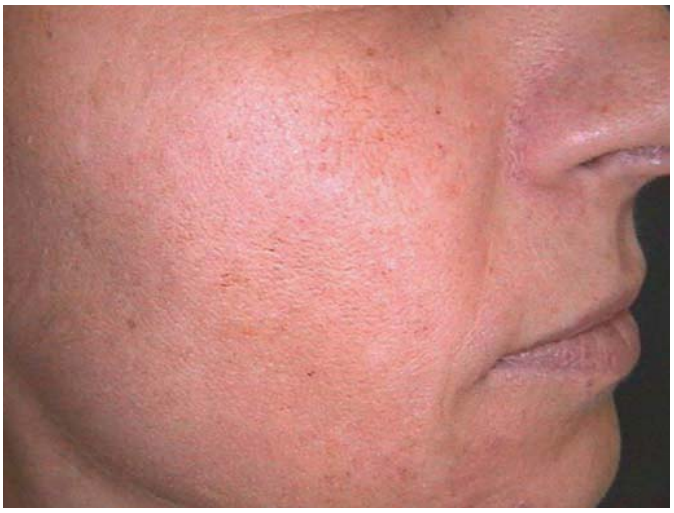

Figure 1.6 Mild/moderate aging of the face

Figure 1.7 Mild aging of the hand

- Low pain
- No necessity for a skin test
- Limited side-effects
- No downtime or recovery time
- Can be performed on every skin phototype

Mesotherapy is an excellent complement to other nonsurgical rejuvenating procedures. It rejuvenates the skin, reducing the need for such procedures. Patients request these other procedures less frequently – this is not because their effects last longer, but rather because mesotherapy rejuvenates the skin, making it appear firmer and healthier. In addition to daily sunscreen use and abstinence from smoking, mesotherapy is another antiaging technique that helps to maintain a globally firm and bright skin and protect it from environmental contributions to aging.

Disadvantages

- Not appropriate for severe aging (Figures 1.8 and 1.9)
- Mild erythema
- Slight itching/burning sensation 5 minutes after injections (especially with injection of vitamin C)
- Small hematomas
- Possibility of allergic reactions
- Lack of controlled clinical trials
- Lack of guidelines according to evidence-based medicine

Figure 1.8 Severe aging of the face

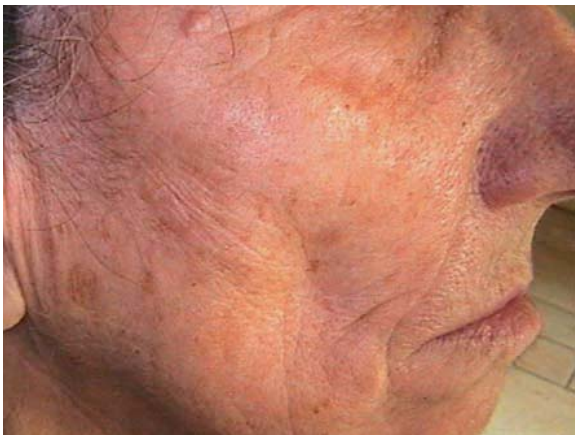

Figure 1.9 Severe aging of the hand

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2 PRODUCTS

Daphne Thioly-Bensoussan and Maria Pia De Padova

With sun damage and progressive reductions in collagen and hyaluronic acid content, the skin loses its plumpness and resiliency. When used for skin rejuvenation, mesotherapy infuses the superficial dermis with potent vitamins, vasodilators, and antioxidants to rejuvenate and revitalize the skin. Injecting into the skin substances necessary for its proper functions seems to be more efficient than applying topical products.

Mesotherapy cocktail

The cocktail is made of revitalizing substances in a sterile biological solution supplied in a 5 ml bottle (NTCF or NCTF 135).[11]

Vitamins

It is easy to understand that there is no absorption problem because these vitamins are injected directly into the dermis.

- Vitamin A regulates turnover of the epidermis and acts on skin flexibility; it helps healing and partially corrects dermis atrophy.
- The vitamin B complex – vitamins B1 (thiamine), B2 (riboflavin), B3 (niacin), B5 (pantothenate), B6 (pyridoxine), B9 (folic acid), and B12 (cyanocobalamin) – are coenzymes in several metabolic processes that help to scavenge free radicals.
- Vitamin C stimulates collagen synthesis and inhibits melanin (acting together with vitamin E).
- Vitamin E is a strong antioxidant because of its anti-free-radical activity.
- Vitamin K has an effect on the microcirculation.
- Also important are vitamins D, H (biotin), B10 and I (inositol).

Amino acids

The cocktail contains 24 amino acids, which are stable, water-soluble and part of the structure of proteins. They build polypeptides, which form the matrix of the cellular architecture. A specific supplementation may restructure or repair the protein structure of tissue that has been damaged by photoaging, smoking, or other causes.

Minerals

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

Coenzymes

These are non-protein organic components that aid the catalytic function of enzymes. They are 'activators' of biochemical reactions and help the turnover of the dermis.

Nucleic acids

DNA and RNA encode the information for polypeptide and protein synthesis from amino acids.

According to Lapiere,[1] a decrease in the number of fibroblasts and loss of interstitial cohesion are fundamental elements of aging. A study has shown a statistically significant effect (p = 0.05) of the cocktail on fibroblast activity (Figure 2.1):

- +12–28% increase after 72 hours' contact time
- 13–35% increase after 168 hours' contact time

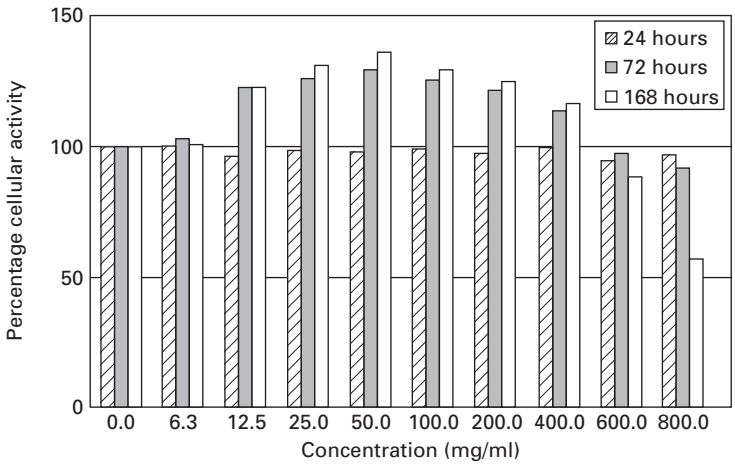

Figure 2.1 Effect of the mesotherapy cocktail NCTF 135 on stimulation of human fibroblasts after 24, 72, and 168 hours of contact. (Adapted from[11].)

Hyaluronic acid

Hyaluronic acid (HA) was discovered in 1934 by Meyer and Palmer in the ocular bovine vitreous. It is a naturally occurring glycosaminoglycan that, by virtue of its viscosity, elasticity, and other rheological properties, acts as an ocular lubricant and as a lubricating and shock-absorbing fluid in joints. It is produced by fibroblasts within the cell membrane and then released into the extracellular space. Within the skin, it plays an important role in the hydration of extracellular space; it constitutes a matrix for supporting the normal functions of the cells; it also has functions in space filling, lubrication, wound healing, modulation of inflammatory cells, and scavenging of free radicals.[2–7] The HA concentration in the epidermis is 15 µg/g and in the dermis it is 740 µg/g; the molecular mass of HA in the skin is 1 kDa. Native HA is a linear polysaccharide chain similar to HA in the dermis. It is a translucent viscoelastic gel that can be obtained in a highly purified form from rooster combs or through bacterial fermentation. It does not have species specificity and the risk of a hypersensitivity reaction is so low that skin testing is not necessary. Its molecular mass varies between 0.1 and 2.5 kDa. One gram of HA can bind up to 6 liters of water. This means that the higher the percentage of HA in a product (mg of HA beads per ml), the higher its capacity will be to

retain water. The greater the molecular mass of HA, the slower is its degradation in the skin, and so its hydration capacity is higher. It is preferable to choose a high molecular mass than a high concentration. HA utilized for mesotherapy is not crossinked, it is not highly stabilized, it is very fluid, and it resists for a shorter period than HA used for fillers (the time for degradation by hyaluronidase is much shorter).

The viscoelastic and moisturizing properties of HA maintain a good hydration status of the dermis, which has two advantages: it provides good flexibility to the extracellular matrix and a stock of water sufficient to hydrate the very superficial layers of the epidermis.

During the skin aging process, there is a continuous reduction in the level of HA, which leads to a drastic reduction in the hydration capacity of the skin, as shown by the deterioration of the mechanical properties of the dermis – i.e., loss of elasticity and turgor (Figure 2.2).[1,8,9]

Every 10 years (with individual variations), the skin loses 6% of its thickness. Reversal of this process was investigated by injecting HA directly with the dermis (through multipunctures) and then observing the restored hydration, elasticity and turgor (Figure 2.3).

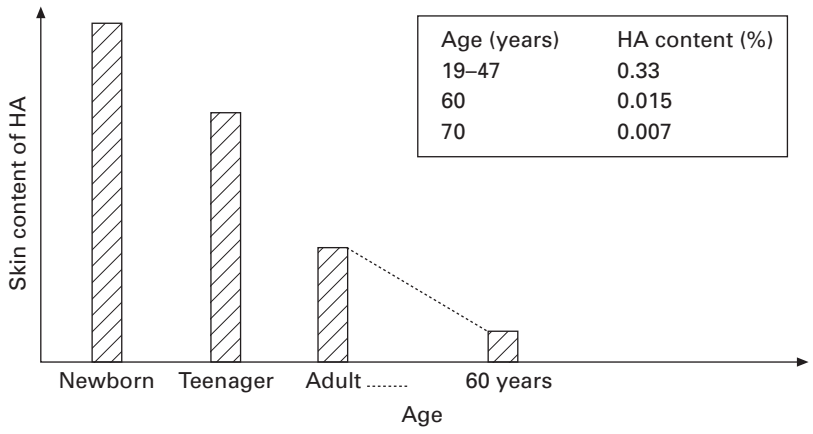

Figure 2.2 Decline in the content of hyaluronic acid (HA) in skin with age[9]

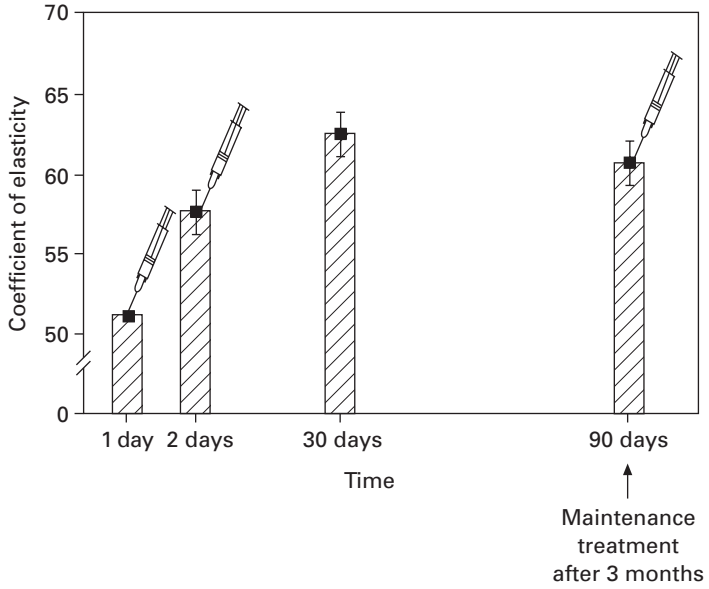

Figure 2.3 Increase in turgor and elasticity following the injection of native hyaluronic acid into the dermis. (Adapted from the Di-Petro A, study, 2001.)

Native non-crosslinked HA injected into the dermis:

- hydrates the skin through a higher water-binding capacity and builds up the extracellular matrix
- reactivates fibroblasts and induces the synthesis of new collagen, elastin, and endogenous HA
- acts as a free-radical scavenger

Brands of native HA for mesotherapy

In syringe (0.5, 1, or 2.5 ml):

- Achyal 1% (1 kDa)
- Re-Fine 1% (2 kDa)
- Hydractive 1%
- Juvelift 1.35% (2.5 kDa)
- Surgilift 1.35% (2.5 kDa)
- Mesolis 1.4% (1 kDa)
- Teosyal Meso 1.5% (1 kDa)
- Zetavisc-L 1.5% (2 kDa)
- Ial System 1.8% (1 kDa)
- Mesolis Plus 1.8% (1 kDa)
- Hyaluderm 2% (2.4 kDa)
- Elastence 3% (0.9 kDa)
- Restylane Vital (crosslinked)

In bottle:

- Mesoesthetic 3.5% pure native HA (10 ml)
- Medicage 3.5% pure native HA (10 ml)
- HCG 2000 0.2% pure native HA (2 and 5 ml) + vitamin C and betaglucan
- Revitacare 1% pure native HA (4 ml) + 10 ml multivitamin solution
- Jalupro 3% pure native HA (30 mg) + 100 mg lyophilized amino acids

HA is also available in fragments (20–38 monomers) in a product called Skin-B. Together with amino acids, coenzymes, glucosamine, and sodium bicarbonate, it is able to activate the CD44 cell surface molecules of the fibroblasts, stimulating skin to produce collagen, elastin, and glucosaminoglycans. In addition, buffering of the acidity of the matrix preserves the sol condition of the colloidal solution, favoring the metabolic exchanges. Fragments of HA plus amino acids in a physiological solution are also available in a product called Skin-R. The CD44 molecules of fibrotic fibroblasts are activated by fragments of HA and an acidic and hypertonic amino acid solution in order to build up fibrotic collagen (type I). Thus, dermal fibrosis and tissue distension will be obtained.

Mesogun injection of hyaluronic acid

A study by GREDECO (Groupe de Recherche et d'Evaluation en Dermatologie et Cosmétologie) from the Pitié Salpêtrière Hospital, Paris, with Dr Sylvie Boisnic as study director, evaluated the effects of an HA-plus-vitamin cocktail injected with a U225 mesogun on experimental

premature aging.[10] The aging skin, after ultraviolet A (UVA) + UVB irradiation, showed alterations in fibroblast metabolism and anomalies in connective tissue macromolecules.

The U225 mesogun was employed as follows: normal-speed injection (4 impacts/cm^2), then bursts (9 shots/s, 500/cm^2). The technique appears to work better when bursts are added to the normal-speed mode.

The results at day 14 showed:

- proliferation of epidermis, with increased mitotic index
- significant augmentation of the percentage of elastic fibers
- evident collagen repair

This was the first study to show repair of epidermis and dermis after one injection of a mesotherapy cocktail and thus the utility of mesotherapy as an antiaging treatement. This study also showed that injecting serum does not improve aging skin, thus demonstrating that it is not only the effect of multipunctures that improves the aged dermis, but also the products injected.

Other products

Easy Agarose RE (poliaminoacidic chains in agarose 0.1% gel)

It is a new biodegradable product with a long-lasting effect due to the absence, in the site of injections, of a specific enzyme (as the hyaluronidase) able to metabolize agarose. This last one has to be carried to the reticulo-endothelial cells system and this requires time.

Agarose gel is used as a vehicle. It is a naturally occurring polysaccharide belonging to the galactan group. It is biocompatible, 100% biologically degradable, and well tolerated by cells and tissues. The gel network is able to create a dynamic equilibrium by releasing biological molecules (amino acids) in continuous exchange with the surrounding tissue. Poli-aminoacidic chains are *Arg-Gly-Asp* (it promotes the endogenous production of fibronectin, an insoluable glyroprotein dimer that serves as a linker in the extracellular matrix, as a general cell adhesion molecule by anchoring cells to collagen or proteoglycan substrates, and as an organizer of cellular interaction with the extracellular matrix), *Poly-L-Lysine* (it acts as a scaffold stimulating the endothelium and it has high capacity in binding water) and *Arg-Gly-Phe-Phe* (it promotes reparative processes and the biosynthesis of the matrix).

Plinest (polynucleotides)

Due to its biochemical, viscoelastic, and moisturizing properties, this improves skin turgor, elasticity, and tonicity.

Single-component injections versus cocktail

Recently, the issue has been raised that injecting a product made up of a single component may be better than injecting a cocktail: side-effects resulting from interaction between different components are reduced and active principles, injected alone, are more effective. However, should we deprive patients of the proven efficacy of the cocktail? This started to show its efficacy many years ago, and, especially for those who want to use crosslinked HA, it is very

important to dilute it, otherwise the intradermal injection sites may be seen for weeks as papules on the skin.

Summary

- From our own experience, we prefer to use 1 ml of native HA (2.5 kDa) + 5 ml of NTCF injected manually with a 32G needle or with a U225 mesogun.
- Optimization of water reserve in the superficial epidermis assures better water retention in the dermis, protection against free radicals, and a pro-angiogenic action.
- Mesotherapy gives to the skin a nice glow, a fresher look, and better moisturization. There is an action on tonicity and firmness, and it helps ptosis of the skin.
- Other additives for mesotherapy cocktails (e.g., procaine or very small amounts of PLLA (poly-L-lactic acid) or DMAE (dimethylethanolamine)) may prove useful, but no study has yet been done to determine the risks of injecting these substances.

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3 METHODOLOGIES

Gabriella Fabbrocini, Patrizia Forgione, and Claudia Capasso

Mesotherapy

Mesotherapy is applied to the mesodermal tissue, where the connective tissue starts. This procedure is something in between acupuncture and reflexogenic techniques. Its inventor, Michel Pistor, defined it as 'an allopathic, mild, polyvalent and regional therapeutic procedure'.[1] Written records of creams and ointments applied by multi-injections go back to AD 1300. In 1923, some veterinarians used this technique successfully. Mesotherapy led to great progress, because it permitted physicians to considerably reduce drug dosages, as will as focusing their attention on physical/chemical stimulations induced by the injections.

It was called 'meso' therapy because it stands 'between' two extreme concepts: on the one hand, there is allopathy, which is toxic, allergenic, and rapid in its side-effects; on the other hand, there is homoeopathy, which is safe, mild, and well tolerated, and uses minimal doses, but sometimes is too slow in acting. The therapeutic effects result from the chemical action of the products used and the reflex stimulation by the multiple punctures made in different sites. With this technique, the quantity of drugs or remedies employed is considerably lower. There is a physical factor represented by the reflex produced by the needle penetrating the dermis and a chemical factor consisting in the direct action of the drug on the dermis.

Mesotherapy is thus an injection technique that conveys microdoses of the drug to the superficial dermis where the action of drug is really necessary.[2] The injections should be limited to the region of the superficial papillary dermis (1.5–2 mm).

For the procedure, common disposable syringes are used with a 4 mm × 0.4 mm (27G) needle (Leble needle) that permits correct intradermal injection in any cutaneous surface. Using this needle, it is easy to avoid telangiectasias and skin lesions. The 13 mm × 0.3 mm (30G) needle, however, is more appropriate for skin biostimulation. If the physician feels more comfortable using a shorter needle, he can leave the cap on the 30G needle and cut away the tip (Figure 3.1). On carefully cleaned skin, a number of strictly intradermal microinjections are performed; here, by microinjection, we mean the injection of 0.10–0.20 ml of drug.

The intradermal injection is performed by inserting the needle at an angle to the skin plane so as to give rise to a small red patch. The number of red patches at an average distance of 1–2 cm must be sufficient to involve the area to be treated for its full extent. The total amount of injected drug should not exceed 3–5 ml.

Mesotherapy guns are available on the market and offer many advantages. Using such a gun, it is possible to chose the desired depth of injection and automate the treatment, thus allowing a more rapid procedure. Moreover, they completely avoid pain (since they do not reach the nerves), they permit considerable savings (since there is no drug backflow during

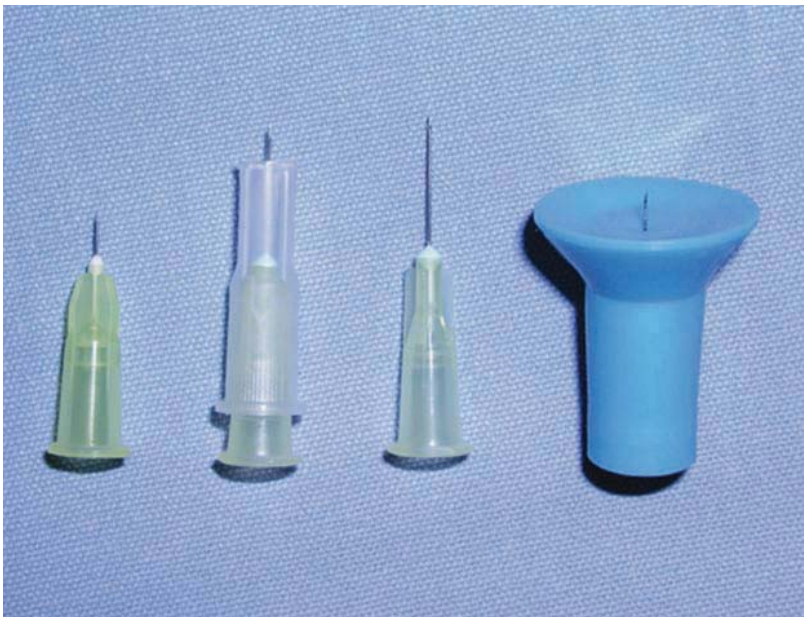

Figure 3.1 Needles used for mesotherapy and SIT needle (the blue one) used for microtherapy

injection), and they avoid the appearance of hematomas (since they do not reach the venules but only the capillaries).

Microtherapy

Microtherapy is a well-studied procedure developed in order to facilitate the intradermal injection of drugs. The use of extra-fine needles permits the drugs to reach the papillary level of the dermis, thus avoiding damage to the skin's superficial nerves and vessels. By so doing, risks and undesired side-effects that might be involved in classical mesotherapy are reduced.

Skin injection therapy (SIT) makes use of an injector, fitted in a normal or Luer-lock syringe, having the shape of an upside-down funnel with a 2 mm-long needle of extra-fine 0.27 mm (32G) diameter (Figure 3.1 and Box 3.1). The external edge of the funnel-shaped injector is placed on the skin using some pressure, stretching it, and thus favoring the penetration of the needle placed in the centre of the funnel. This makes injection of the drug painless and nontraumatic.

Once the established dose of the drug has been injected, the pressure is released and the injection hole is closed by the elastic return of the skin. A small drop of the substance will remain on the skin surface due to the discharge of the pressure of the syringe's rubber piston, which behaves like an elastic chamber. This drop will be absorbed after a while.

Among the advantages of this procedure, we should mention the following:

- painless injections, because the needle does not reach the nerves
- reduced hematomas, since only capillaries and not venules are touched
- slow absorption of the drug, because it does not reach the venules of the deep dermis and thus barely enters the circulation, remaining locally active for a long time
- no scars in the deep dermis that might cause undesired sequelae

BOX 3.1 SIT DISPOSABLE INJECTOR FOR MICROTHERAPY: TECHNIQUE

Taking treatment of a lower limb as example, the microinjections are performed 2 cm apart, forming vertical lines that cover the entire limb in a 'net' from the root of the thigh to the ankle

1 Insert the SIT microinjector onto a normal syringe having a capacity ≤5 ml (initially, it is advisable to use syringes with a lower capacity of 2.5–1 ml so as to better control the microdoses and in order to get used to the quantity to be injected
2 Keep the syringe between the index finger and the middle one, like a cigarette. Place the SIT perpendicularly on the skin, making sure that the circumference of the suction cup completely adheres to the skin
3 Exert moderate pressure, stretching the underlying skin well, then press the piston of the syringe with the thumb
4 Avoid exerting too much pressure on the piston, in order to prevent red patches. Moreover, excess pressure would cause a useless waste of the drug, whereas stretched skin absorbs only small quantities of fluid
5 If the pressure is correct, only a small drop will remain on the skin due to the vacuum created under the suction cup of the SIT and to the tension of the syringe's rubber piston
6 Dry with a cotton swab

Transdermal electroporation

Dermoelectroporation represents a very interesting methodology with manifold applications in skin pathology and cosmetology.

On the one hand, the skin is an important barrier to foreign substances entering the body and, on the other, a potential pathway that can be used for the transport of active functional principles or for therapeutic purposes in the skin and the body. Recent studies have outlined innovative procedures to diffuse pharmacologically useful substances through the horny layer, which represents the most limiting factor in the spread and penetration process.[3]

The horny layer has a unique structure that plays a determining role in barrier function. Among the various intracellular components of this layer there are neither lipids nor a lipid functional matrix around the keratin strands or around the keratohyaline; thus, corneocytes are almost impenetrable.[4]

A penetration pathway through the interstitial spaces is represented by the degradation of corneodesmosomes, which leads to the formation of a continuous lacunar domain (aqueous pore). Some instrumental procedures have been tried in order to increase the penetration of active substances to obtain a locoregional effect or to get them into the circulation, avoiding traumatic penetration with a needle. These systems aim to reach the target area with a suitable drug concentration at some depth and in a selective way, without dispersion in the circulation (transdermic systems).

Electroporation is an electrically aided method for increasing drug/substance diffusion through the horny layer.[5]

Mechanism of action

In 1970, American dermatologists discovered that an intense electric charge applied for a short time at the right duration produced an alteration in the polarization of the cell membrane.[6] This method was called 'electroporation' and was used, with appropriate care, for the transdermal treatment of melanomas.

In 2003, the Nobel prize winners Peter Agree and Roderick Mac Kinnon, at the Biological Chemistry School of the Johns Hopkins University and at the Neurobiology School of Rockfeller University, respectively, clarified the molecular and biophysical mechanisms that regulate water and potassium ion transport from the outside to the inside of the cell and vice versa.[7] These studies permitted identification of the so-called electropores or hydropores: aqueous channels consisting of transmembrane proteins that form within themselves a hydrophilic channel made of polar amino acid residues able to transport water and ions or molecules inside the cell.[8] The application of these principles has given rise to the method of electroporation, aimed at increasing the transcutaneous absorption of molecules having a pharmacological trophic activity. More than 4000 scientific papers published so far have demonstrated the method's activity and possibilities. At the University of Florence, experimental studies were carried out demonstrating the passage of bovine collagen type I chains (large, 0.8 μm, molecules) through rat skin by using electroporation.

Dermoelectroporation has evolved from this initial procedure. It makes use of the capacity of transcutaneous absorption, employing a system that transmits characteristic stimuli capable of causing the opening of particular 'electric doors' that can be used for the passage of appropriately sized substances, avoiding damage to the cell membranes.[9]

For clinical and cosmetic purposes, different devices have been used. The electrical activity of electroporation is produced by a charge sent to a 100 V condenser and thus discharged with a typical form of reversible exponential wave. In contact with the skin, a very strong current is produced, which disturbs the normal potential value, in turn causing an increase in permeability that is defined as electroporation. This state remains for a limited time because, owing to an electrolytic conduction mechanism, the potentials tend to re-equilibrate.

The technical innovation of the equipment consists in the use of wavetrains and controlled-intensity currents. The equipment produces a sequence of impulses of opposite polarity so as to avoid electrolytic phenomena on the electrodes.

The method

The method is based on the application to an epithelial surface of an electric impulse that is able to generate a transmembrane potential difference of 0.5–1.5 V, giving rise to the phenomenon of poration of cell membranes. By the same method, an electrochemical perturbation of the horny layer is produced, with a consequent increase in permeability. The horny layer represents the main hindrance to the penetration of hydrophilic molecules and/or of molecules having a high molecular weight, and only those with a specific molecular weight and lipophilic properties can be passively diffused in the horny layer and reach the dermal region.[10]

The procedure is absolutely painless and safe for the patient.

The system is characterized by a 100 V condenser that generates a typical reversible exponential wave and by a metallic activation chamber in which is placed a conductive gel containing the molecules that it is desired to have penetrate the skin.

This phenomenon takes place some minutes after the application of the electric charge on the skin; the duration of the electropore opening depends on the wavelength of the electromagnetic wave generated, and can vary from a few seconds to some minutes.

The electropores permit the transport within the cells of molecules that usually do not succeed in penetrating because of their high molecular weight. The aqueous channel is rather large (1–2 μm), permitting the passage of molecules such as medium-molecular-weight polysaccharides (hyaluronic acid), peptides (soluble collagen), and glucosides (Figure 3.2).

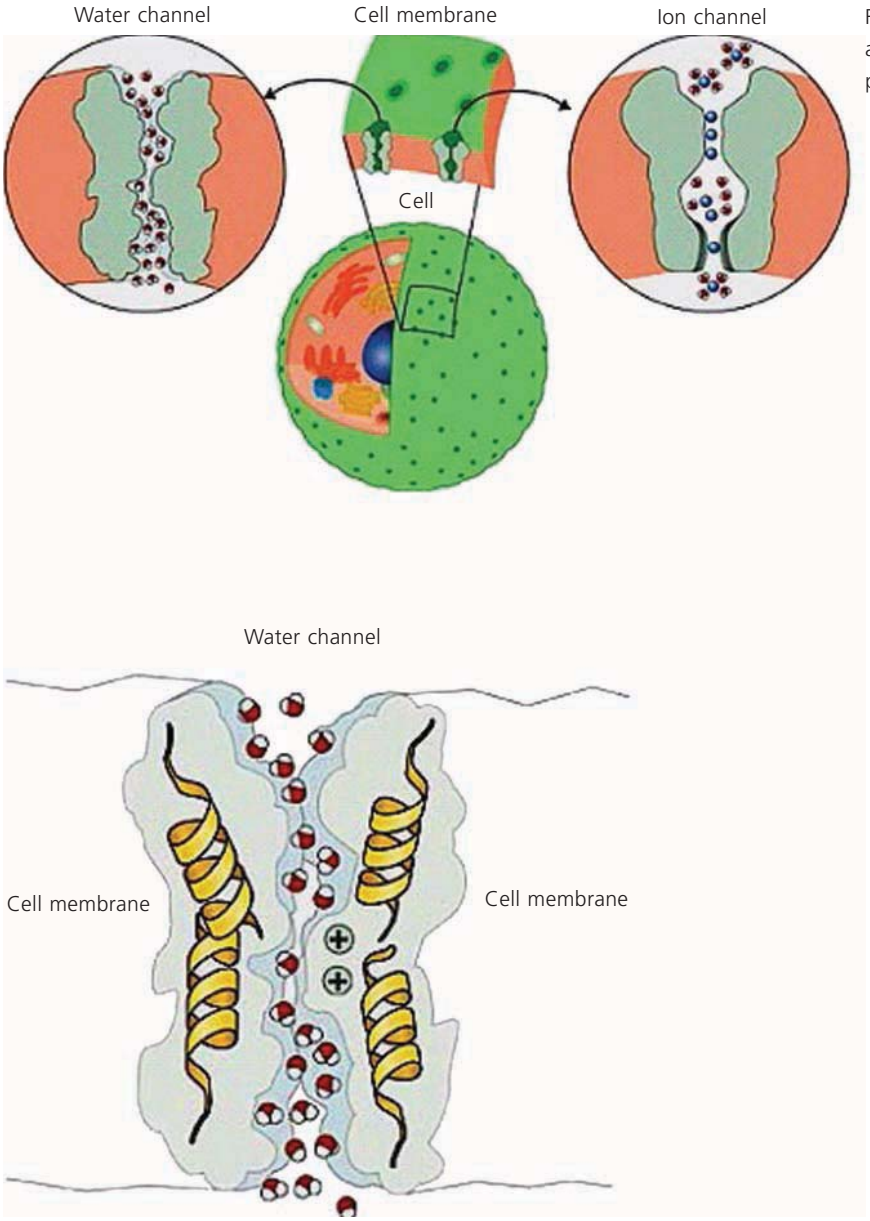

Figure 3.2 Formation of aqueous channels and penetration by molecules

Once formed, these channels remain open for a relatively long time (i.e., a few seconds). This state is maintained for a limited period of time, after which the potentials tend to re-equilibrate because of electrolytic conduction.

Applications

The treatment includes a session of crystal microdermoabrasion or an electronic peeling performed by cavitation that brings about detachment of the horny layer; this is followed by a superficial peeling that is necessary in order to enhance the quality of the treatment (Figure 3.3). The second stage consists of the introduction of revitalizing substances (hyaluronic acid, vitamins, peptides, etc.) in the conductive gel, which is then ionized in the ionization chamber and then applied to the area to be treated by a light massage[11] (Figure 3.4).

Figure 3.3 Cavitation

Figure 3.4 Electroporation

The treatment lasts about 30 minutes, including the pre-peeling (cavitation stage), and can be repeated after about 1–2 weeks for a cycle of 10 sessions at most (Figures 3.5–3.8).

The good results obtained have permitted the use of this procedure for the introduction of botulinun-toxin-like substances to the fine wrinkle areas of the face, and it has been suggested that it could also be used with draining and vascularizing substances for treating streaks and scars. In conclusion, dermoelectroporation represents a new frontier in the application of knowledge of the physiopathology of the interstitial matrix, and holds great promise for the future.

Figure 3.5 Patient before treatment

Figure 3.6 Patient after treatment

Figure 3.7 Patient before treatment

Figure 3.8 Patient after treatment

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4 INJECTION TECHNIQUES

Maria Pia De Padova, Matilde Iorizzo, and Antonella Tosti

Picotage or nappage

This is the classic injection technique. Single punctures are performed, injecting one drop of the product into the superficial dermis. The injections are spaced 1 cm apart and the needle penetrates the treated area 2–2.5 mm (Figures 4.1–4.3). The needle can be vertical or angled 45° obliquely and the physician maintains a constant pressure on the plunger (Figures 4.4–4.7).

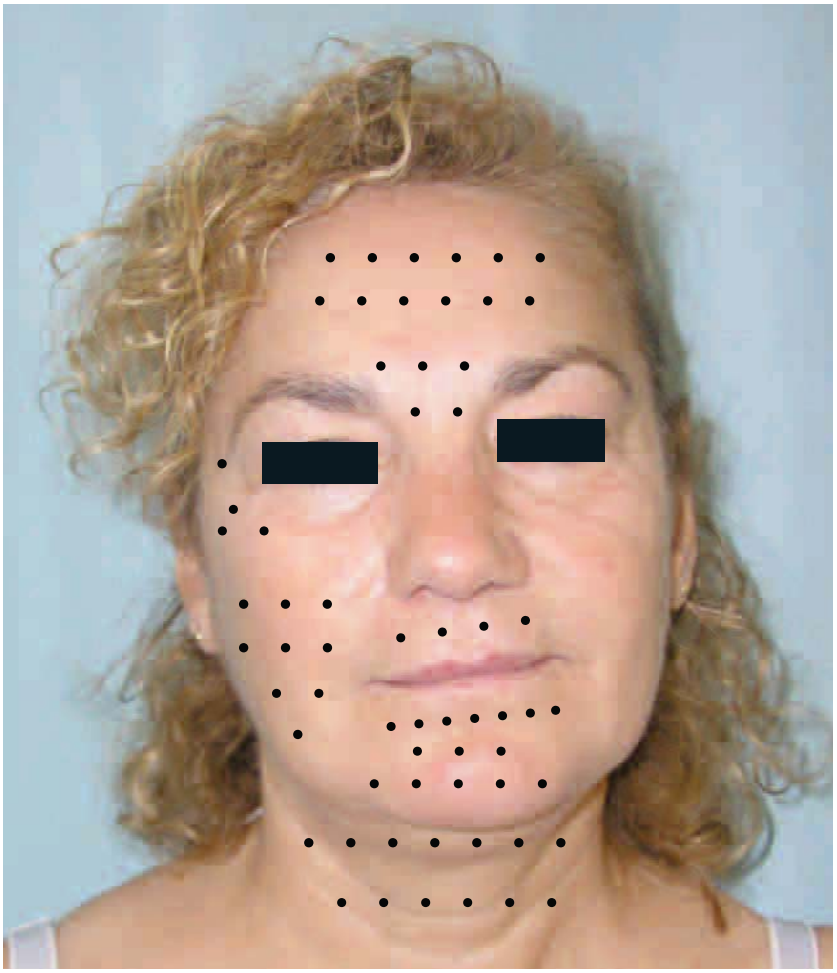


Figure 4.1 Face and neck: dots show where the physician should perform the punctures

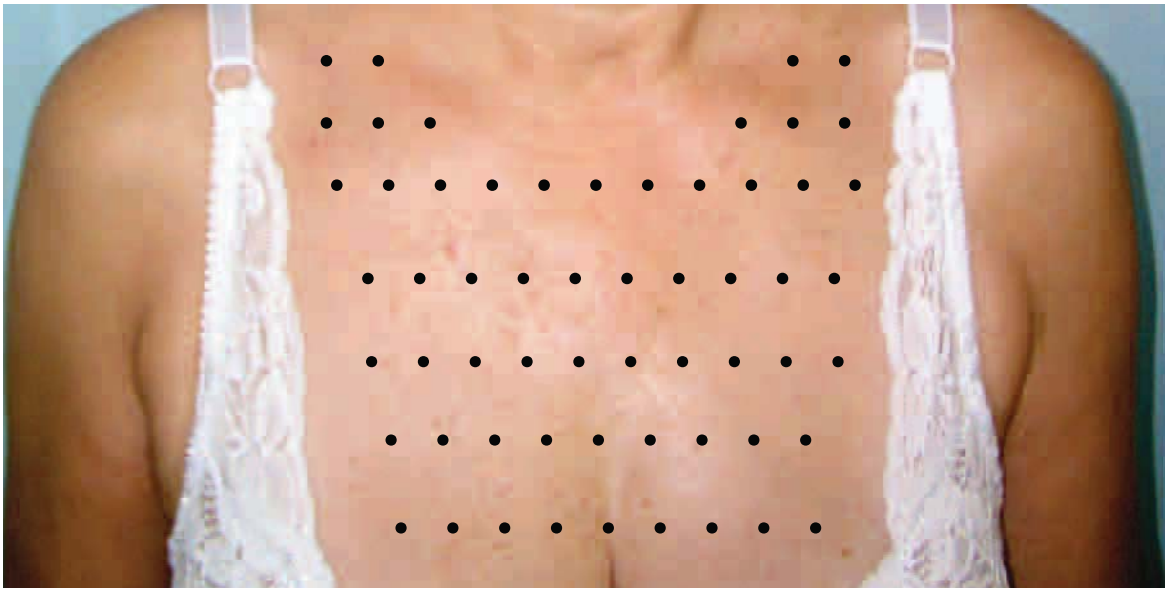


Figure 4.2 Low neckline: dots show where the physician should perform the punctures

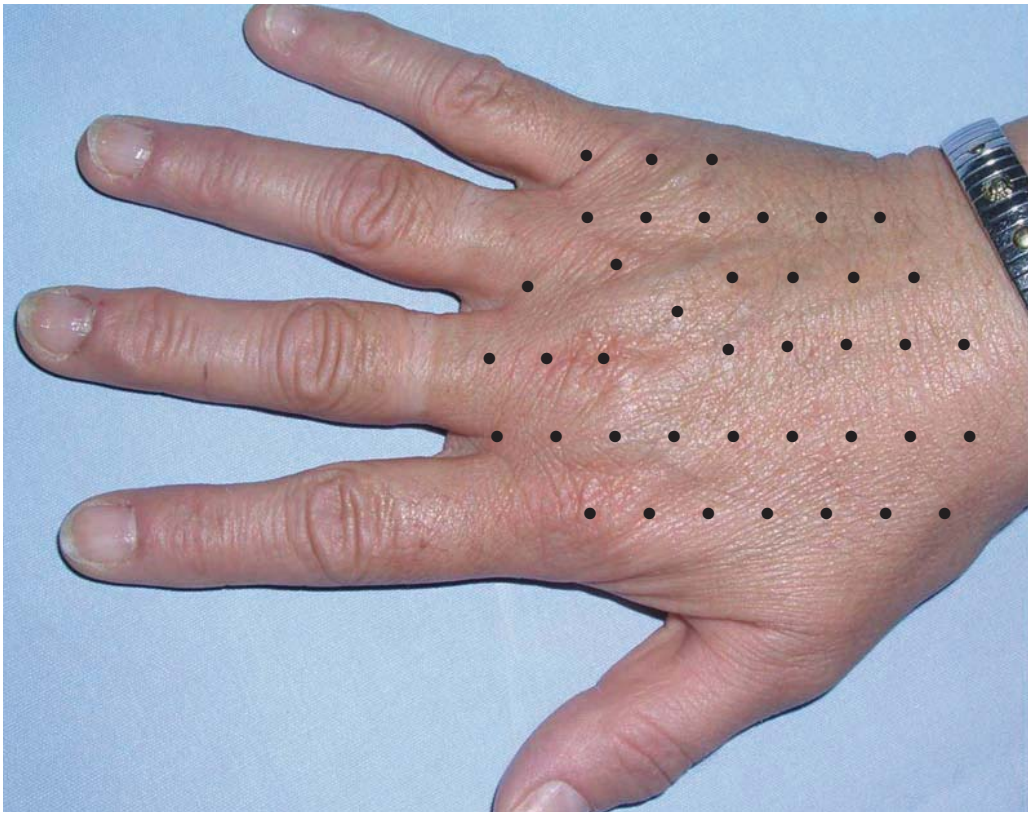


Figure 4.3 Back of hand: dots show where the physician should perform the punctures

(a)

(b)

Figure 4.4 (a) Face: vertical needle and physician maintaining a constant pressure on the plunger. (b) Areas of the face where it is important to stress the injection of the product: the main target of mesotherapy in these areas is to improve skin texture.

Figure 4.5 Low neckline: needle 45° oblique and physician maintaining a constant pressure on the plunger

Figure 4.6 Low neckline: a few minutes after the injections

Figure 4.7 Back of hand: needle 45° oblique and physician maintaining a constant pressure on the plunger

Linear threading

Only vertical or horizontal injections are performed. Vertical injections are useful to prepare nasal–labial and glabellar wrinkles 10–15 days before injecting dermal fillers and botulinum toxin (Figure 4.8). Horizontal injections are useful in treating neck wrinkles (Figure 4.9). The needle is always 45° oblique.

Figure 4.8 (a) Linear threading: during treatment

Figure 4.8 (b) Linear threading: after treatment

Figure 4.9 Linear threading: horizontal injections to treat neck wrinkles

Crosslinking or cross-hatching

Vertical injections, threading the needle in all of its length, followed by horizontal injections (1 cm distance between lines) are performed (Figure 4.10). The product is injected during the extraction of the needle from the dermis. This technique is particularly useful for the cheeks and low neckline in more advanced stages of chronoaging. The needle is always 45° oblique.

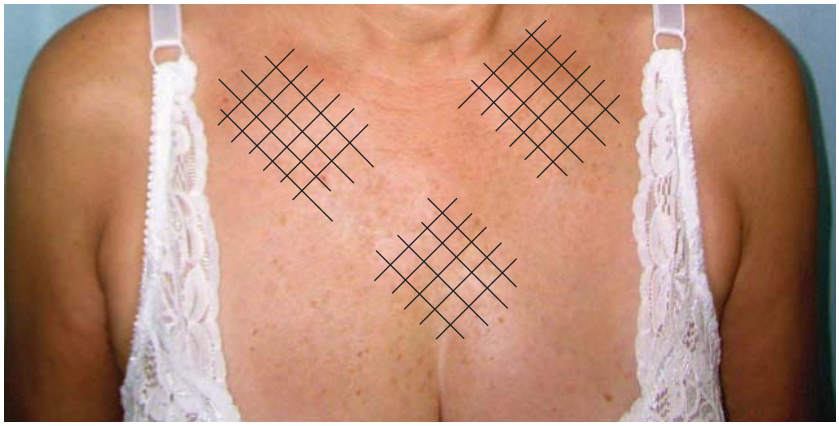


Figure 4.10 Lines indicate where the physician should inject the product

5 MANAGEMENT OF THE PATIENT

Matilde Iorizzo, Maria Pia De Padova, and Antonella Tosti

Management of the patient undergoing mesotherapy entails the following steps for the physician:

- Identify and exclude patients with body dysmorphic disorders.
- Obtain medical history and exclude patients with specific contraindications.
- Discuss the patient's expectations.
- Discuss the procedure and alternative.
- Obtain a completed patient consent form (Box 5.1).
- Perform photographic documentation in order to evaluate results (remember to remove any make-up from the patient).

BOX 5.1 PATIENT CONSENT FORM

Patient's name: _____

Birth date: _____

Address: _____

Phone No.: _____

Sanitary No.: _____

Home physician: _____

Do you smoke? No _____ Yes _____ No. of cigarettes per day _____

Do you drink alcohol? No _____ Yes _____ No. of drinks per week _____

Last menstrual period: _____ Monthly? No _____ Yes _____

Medical history (Please put a check mark next to a past or current condition):

___ Allergy (any types)

___ History of hypertrophic scars

___ Lupus or other autoimmune disorders

___ Bleeding abnormalities and/or anticoagulant therapy

___ Pregnancy/breast feeding

___ Herpes simplex virus type 1 infections

___ Bacterial infections

___ Inflammatory skin disorders

___ Epilepsy

___ Diabetes

___ Hepatitis C virus

___ HIV

___ any hospitalizations or surgery

___ any drug intake

What conditions/areas do you want to improve?

_____

What are your goals?

_____

Is this your first rejuvenating treatment? Yes _____ No _____

Treatments done before _____

Description of procedure. Mesotherapy for skin rejuvenation is a nonsurgical injection technique that promotes the reconstruction of an optimal physiological environment for fibroblasts, with enlargement of cellular activity, production of collagen, elastin, and hyaluronic acid that produce firmness, brightness, and moisturization of the skin. Microinjections of a customized mixture of hyaluronic acid, vitamins, amino acids, and coenzymes are performed directly into the skin dermis.

All the products are biocompatible and totally absorbable.

I hereby authorize these injections into my _____ *(insert body area).*

I understand that an average of 8–10 treatments are required for mesotherapy to be most effective; other treatments may then be necessary over the years to maintain the results. I realize that each individual's treatment response may be different; therefore, the number of treatments necessary to achieve the desired results may vary. I understand that it is important to follow the recommended schedule for future treatments to obtain the best results. I understand that there have been no warranties, assurances, or guarantees of successful treatment made to me.

I have been informed of possible risks and side-effects. Bruising, irritation, bleeding at the site, and small hematomas might occur after each session. They are, however, transitory. Rare but reported risks include infection and allergic reaction manifested as redness, swelling, and high discomfort in the injected sites.

I may terminate treatment at any time. I have had the opportunity to ask questions, and answers have been given to me. I understand that the physician may choose to take before-and-after photographs of my treatment area(s) for the purpose of monitoring my progress as well as for promotional and educational purposes.

Patient's signature: _____ Physician: _____

Date: _____

6 THERAPEUTIC SCHEME

Maria Pia De Padova, Matilde Iorizzo, and Antonella Tosti

After cleaning the skin with an antiseptic solution (without alcohol) (Figure 6.1), microinjections are performed (see Chapter 4) (Figures 6.2–6.11) and a gentle massage is given after treatment (like the one usually done after filler injections) (Figure 6.12). Fresh physiological saline solution and a moisturizing cream can also be applied on the treated area with a gentle massage (Figures 6.13 and 6.14).

The procedure generally takes around 20 minutes, but may vary, depending on the treated area. Avoidance of sun exposure and smoking are recommended for the next 48 hours. There is no downtime or recovery time for this procedure (Figure 6.15). The patient will be back to regular activities immediately. This procedure can be carried out as a so-called 'lunch hour treatment'. Mild erythema (Figures 6.16–6.19), a slight itching/burning sensation 5 minutes after injections, and small hematomas are sometimes possible (Figures 6.20–6.22).

Treatments should be given once every 2 weeks for 3–4 weeks; then once a month for 3–4 months. With crosslinked hyaluronic acid, treatments should be given once a month for 3–4 months; then once every 2–3 months. The results are maintained by touch-up treatments once or twice a year.

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

Tips and tricks

To avoid hematomas/bleeding:

- Do not perform mesotherapy during a patient's menstrual period.
- Do not let the patient take aspirin or a nonsteridal anti-inflammatory drug (NSAID) for a few days before and a few days after the procedure.
- Inject the product slowly, to avoid the high pressure breaking vessel walls.
- Apply antibiotic cream after each session.

To avoid pain, in sensitive patients:

- Pinch or stretch the skin during the injections.
- Perform the injections precisely.
- Change the needle several times during each treatment.
- Choose products containing lidocaine or apply Emla cream 1 hour before treatment.
- Talk with the patient a lot during the session!

Figure 6.1 The skin is cleaned with an antiseptic solution without alcohol

Figure 6.2 Picotage technique on the cheek

Figure 6.3 Picotage technique on the cheek: end of a session

Figure 6.4 Picotage technique under the chin

(a)

(b)

(c)

Figure 6.5 (a–c) Picotage technique on the forehead

(a)

(b)

Figure 6.6 (a, b) Picotage technique on the top of the nose, useful to prepare the skin for botulinum toxin injections

(a)

(b)

Figure 6.7 (a, b) Neck: you can perform both picotage and linear threading techniques

(a)

(b)

Figure 6.8 (a, b) Neck: you can perform both picotage and linear threading techniques

Figure 6.9 Picotage technique on the low neckline

Figure 6.10 Picotage technique on the low neckline

Figure 6.11 Picotage technique on the low neckline

(a)

(b)

Figure 6.12 (a) A gentle massage is performed after treatment to allow the product left on the skin to be completely absorbed, (b) The absorption is completed after few seconds

Figure 6.13 Fresh physiological saline solution is applied with gauze on the treated area

Figure 6.14 A moisturizing cream is applied on the treated area with a gentle massage

Figure 6.15 The patient after treatment

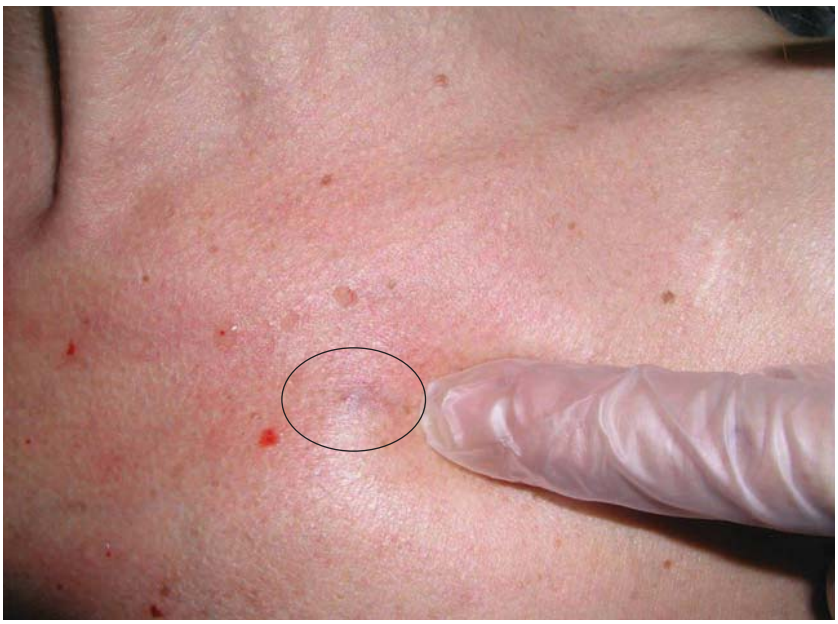
Figure 6.16 Mild erythema lasting 5 minutes after injections

Figure 6.17 Mild erythema lasting 5 minutes after injections

Figure 6.18 Mild erythema lasting 5 minutes after injections

Figure 6.19 Mild erythema lasting 5 minutes after injections

Figure 6.20 Small hematoma



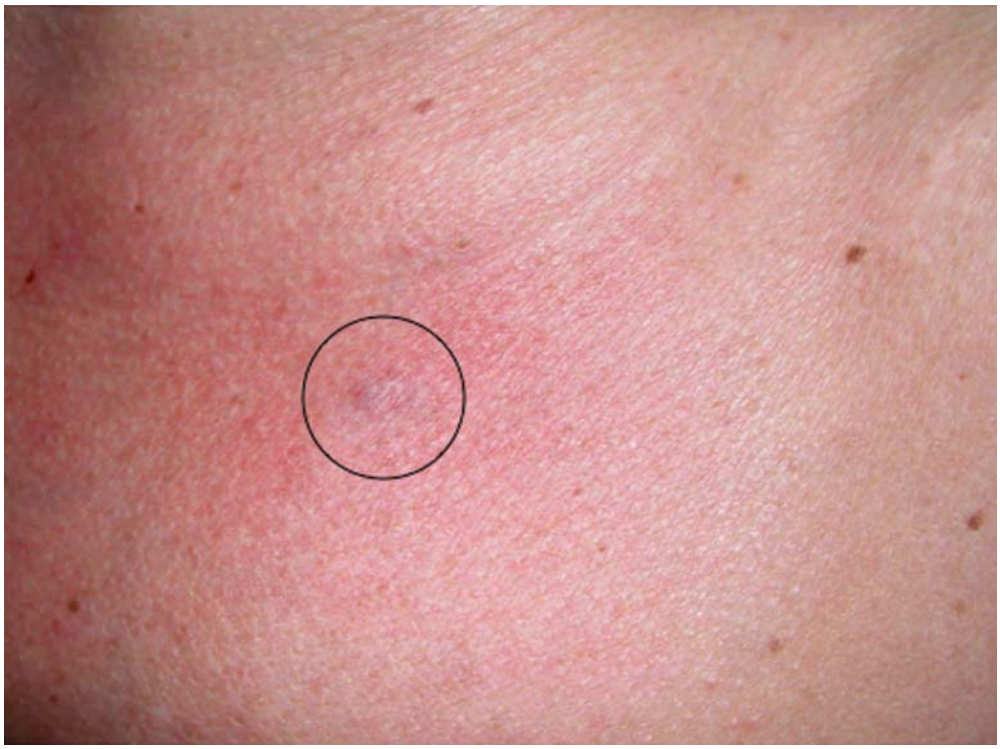


Figure 6.21 Small hematoma

Figure 6.22 Small hematoma

7 RESULTS

Maria Pia De Padova, Matilde Iorizzo, and Antonella Tosti

With mesotherapy, the skin appears firmer, brighter, and better moisturized. Typically two or three treatments are necessary to see these results – although the brightness may be visible after the first due to vascular stimulus by the microinjections. The number of treatments varies from patient to patient and depends on the treated area and the patient's expectations. Maintenance of the results is related to the patient's lifestyle. Performing mesotherapy on young skin is, of course, different from performing it on aging skin.

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

Mesotherapy improves the skin globally; fillers and botulinum toxin improve the skin only locally, in the areas where they are injected.

Mesotherapy is an excellent complement to other nonsurgical rejuvenating procedures, especially if performed 1–2 months before to prepare the skin to better receive other treatments. After mesotherapy, patients request more invasive procedures less often; the skin is in fact more hydrated and fillers and botulinum toxin applied subsequently last longer. Treatment costs are then reduced and the feeling between the patient and its physician improves!

With mesotherapy, the skin looks firmer, brighter, and moisturized (Figures 7.1–7.34).

(a) (b)

(c) (d)

Figure 7.1 A patient (a) before, (b) just after, (c) 2 weeks after, and (d) 4 weeks after treatment

(a)

(b)

Figure 7.2 A patient (a) before and (b) 2 weeks after treatment

(a)

(b)

(c)

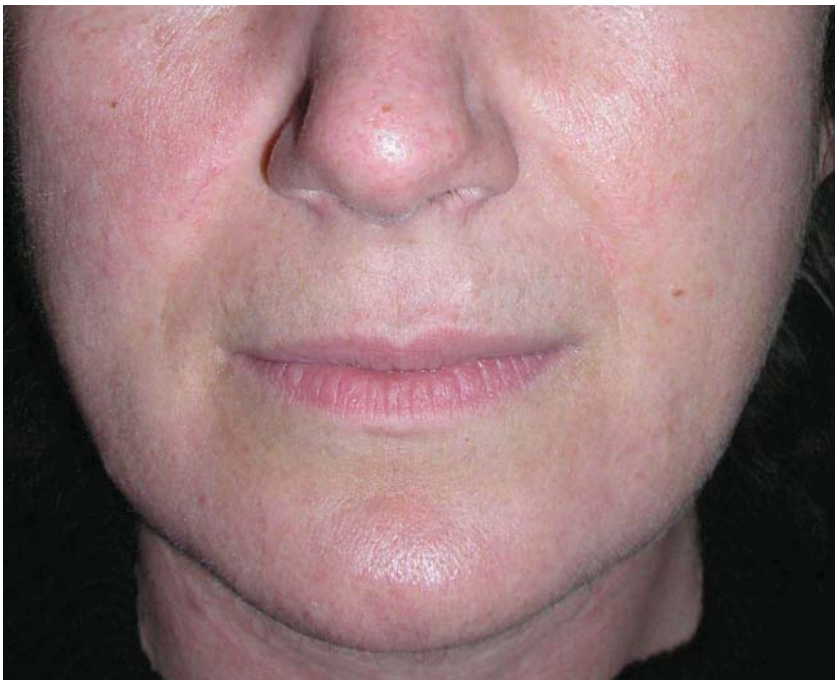
Figure 7.3 A patient (a) before, (b) 3 weeks after, and (c) 2 months after treatment

(a)

(b)

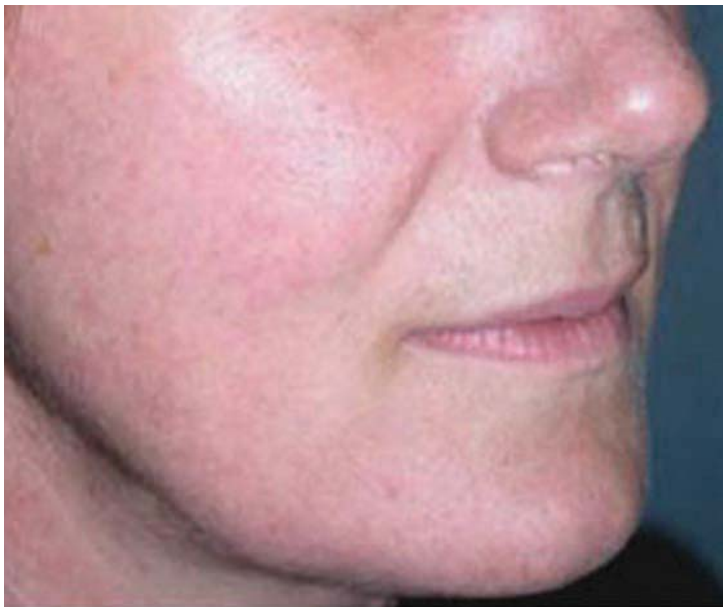
Figure 7.4 A patient (a) Before and (b) 3 weeks after treatment

(a)



(b)

Figure 7.5 A patient (a) before and (b) 2 weeks after treatment



(a)

(b)

Figure 7.6 (a, b) Lateral views as in of the same patient of Figure 7.5

(a)

(b)

Figure 7.7 A patient (a) before and (b) 2 weeks after treatment

(a)

(b)

Figure 7.8 (a, b) Lateral views of the same patient as in Figure 7.7

(a) (b)

(c) (d)

Figure 7.9 Front and lateral view of a patient before and 3 weeks after treatment

(a)

(b)

Figure 7.10 A patient (a) before and (b) after 1 month treatment

(a)

(b)

Figure 7.11 (a, b) Lateral views of the same patient as in Figure 7.9

(a)

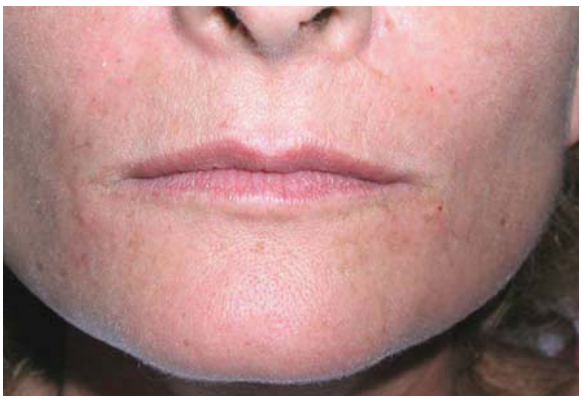
(b)

Figure 7.12 (a, b) Lateral views of the same patient as in Figure 7.9

(a)

(b)

(c)



(d)

Figure 7.13 (a–d) The same patient as in Figure 7.9; note how the skin texture has improved during treatment sessions

(a)

(b)

Figure 7.14 The same patient as in Figure 7.9; even small scars around the mouth (a) can be treated with mesotherapy (b). The scars do not disappear but, being hydrated, their texture improve.

(a)

(b)

Figure 7.15 A patient (a) before and (b) after 1 month of treatment

(a)

(b)

Figure 7.16 A patient (a) before and (b) 2 weeks after treatment

(a)

(b)

Figure 7.17 A patient (a) before and (b) 2 weeks after treatment

(a)

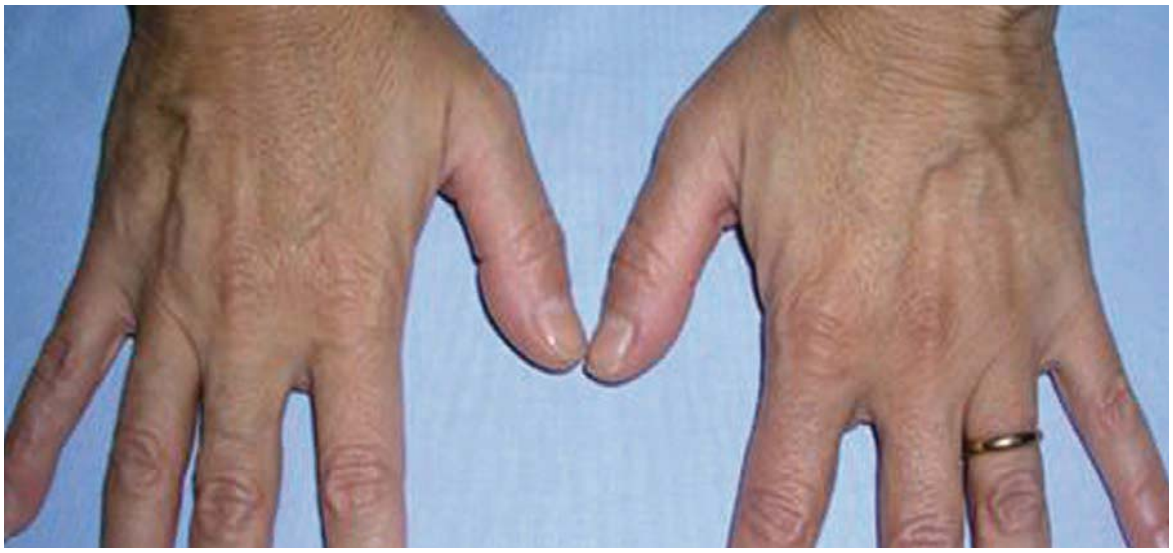
(b)

Figure 7.18 A patient (a) before and (b) 2 weeks after treatment

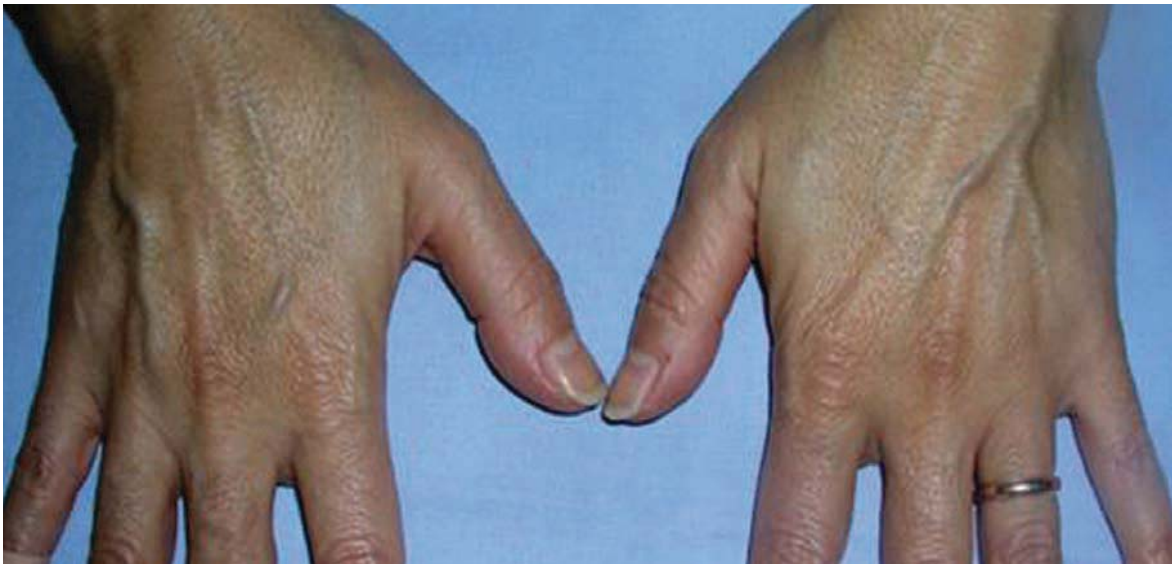
(a)

(b)

Figure 7.19 A patient (a) before and (b) 2 weeks after treatment



(a)



(b)

Figure 7.20 A patient (a) before and (b) 2 weeks after treatment

(a)

(b)

Figure 7.21 A patient (a) before and (b) 2 weeks after treatment

(a)

(b)

Figure 7.22 A patient (a) before and (b) 2 weeks after treatment

(a)

(b)

Figure 7.23 A patient (a) before and (b) 2 weeks after treatment

(a)

(b)

Figure 7.24 A patient (a) and before (b) 2 weeks after treatment

(a)

(b)

Figure 7.25 A patient (a) before and (b) 2 weeks after treatment

Figure 7.26 A patient (a) before and (b) after mesotherapy plus filler injections

(a)

(b)

Figure 7.27 A patient (a) before and (b) after mesotherapy plus filler injections

(a)

(b)

Figure 7.28 A patient (a) before and (b) after mesotherapy plus filler injections

(a)

(b)

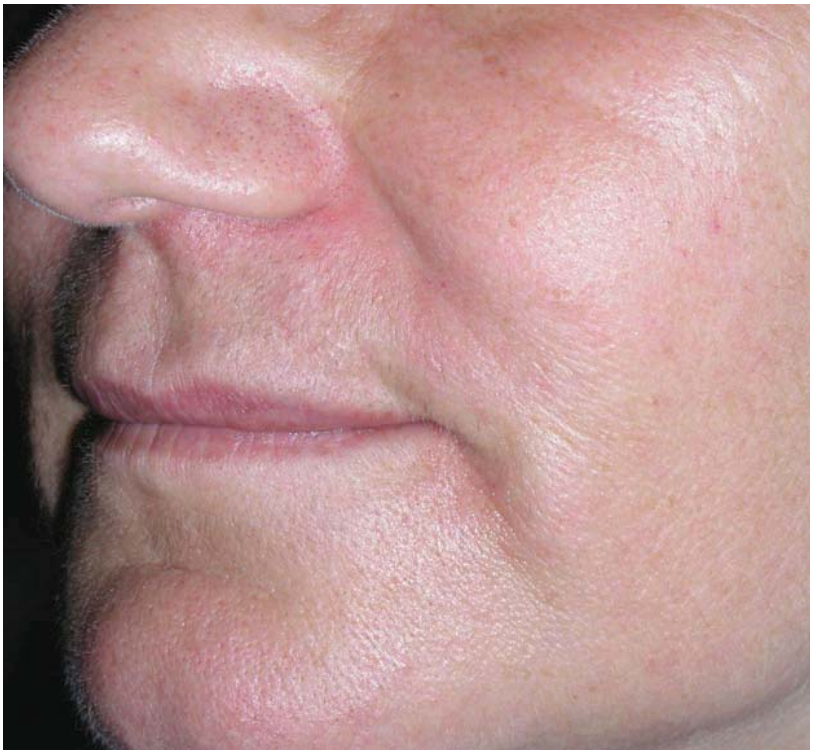


Figure 7.29 A patient (a) before and (b) after mesotherapy plus filler injections

(a)

(b)

Figure 7.30 (a, b) The same patient as in Figure 7.29

(a)

(b)

Figure 7.31 A patient (a) before and (b) after mesotherapy plus filler injections

(a)

(b)

Figure 7.32 A patient (a) before and (b) after mesotherapy plus filler injections

(a)

(b)

(c)

Figure 7.33 A patient (a) before treatment, (b) just after a mesotherapy session, and (c) after filler injections

Figure 7.34 Dermoscopic evaluation of skin texture (a) before and (b) one month after treatment. After 1 month skin looks much more hydrated.

8 ULTRASOUND EVALUATION OF MESOTHERAPY IN SKIN REJUVENATION

Francesco Lacarrubba, Beatrice Nardone, Aurora Tedeschi, Rolf Nordstrom, and Giuseppe Micali

Ultrasound imaging is a noninvasive technique using the various acoustic properties of biological tissues.[1,2] The equipment consists of an ultrasound probe, a computerized image processing system, and a monitor. The probe emits ultrasound waves, which are transmitted into the tissue, where they are reflected or refracted, following the laws governing interfaces between structures of different acoustic impedance, and analyzed after returning to the probe.[1]

Typically, echo signals are represented as a one-dimensional diagram (A-mode) or a two-dimensional image (B-mode). Equipment using frequencies of 20 MHz or more is best for ultrasound of the skin. Using B-mode imaging, normal skin typically shows an epidermal entrance echo, the dermal layer, and the subcutaneous layer (Figure 8.1).[1,2]

The epidermal entrance echo appears as a highly reflecting band, and probably corresponds to the stratum corneum, which acts as the skin's water barrier. The interface between epidermis and dermis is usually not well defined. The dermis is less echogenic than the epidermal entrance echo and contains different echoes of various intensities. Dermal echoes arise as a result of the reflection of the ultrasound waves from the interface between collagen fibers

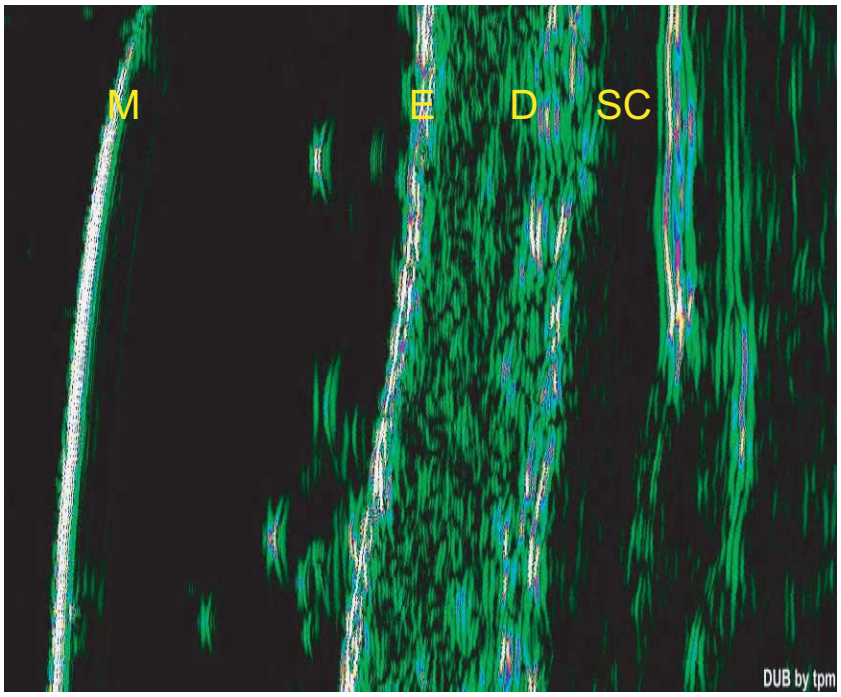


Figure 8.1 20 MHz ultrasound image of normal skin. M, probe membrane; E, epidermal entrance echo; D, dermis; SC, subcutis

and the surrounding intercellular matrix and cells. The subcutaneous space is normally weakly or non-reflecting, so that the interface with the dermis is well defined.

Ultrasound examination of the skin offers a wide range of possibilities in clinical and experimental dermatology.[1,2] It is mostly used for evaluation of the thickness of skin tumors (e.g., basal cell carcinomas and melanomas). Further areas of research include scleroderma, psoriasis, and aging and photoaging of skin.

Skin aging is a combination of intrinsic and environmentally induced processes, predominantly due to ultraviolet light exposure, that result in tissue alterations such as collagen degradation, elastosis, and development of visible lines and wrinkles.

Ultrasound of the skin has been extensively used to visualize and quantify age-related dermal changes. In 1989, de Rigal et al[3] identified a low-echogenic band-like structure, called the subepidermal low-echogenic band (SLEB) (Figure 8.2), located immediately below the epidermal entrance echo of aged skin. They also noted that the SLEB thickness increased as a function of age, indicating that SLEB could be used as a marker of aging. Also, the evidence that the SLEB thickness was higher on the dorsal side of the forearm than on the ventral side suggested that SLEB was strongly associated with photoaging. The presence of SLEB in photodamaged skin has been confirmed by other studies.[4–7]

Mesotherapy is a treatment currently used in cosmetic dermatology. It is a minimally invasive technique and not a tissue augmentation, and consists in the injection, through dermal multipunctures, of bioactive substances. It promotes skin 'rejuvenation' by increasing hydration and re-creating a favorable environment to facilitate activation of fibroblasts and exchanges and interactions between cells and the extracellular matrix.[8] In general, the procedure must be repeated at intervals ranging from 2 weeks to 2 months for several months.

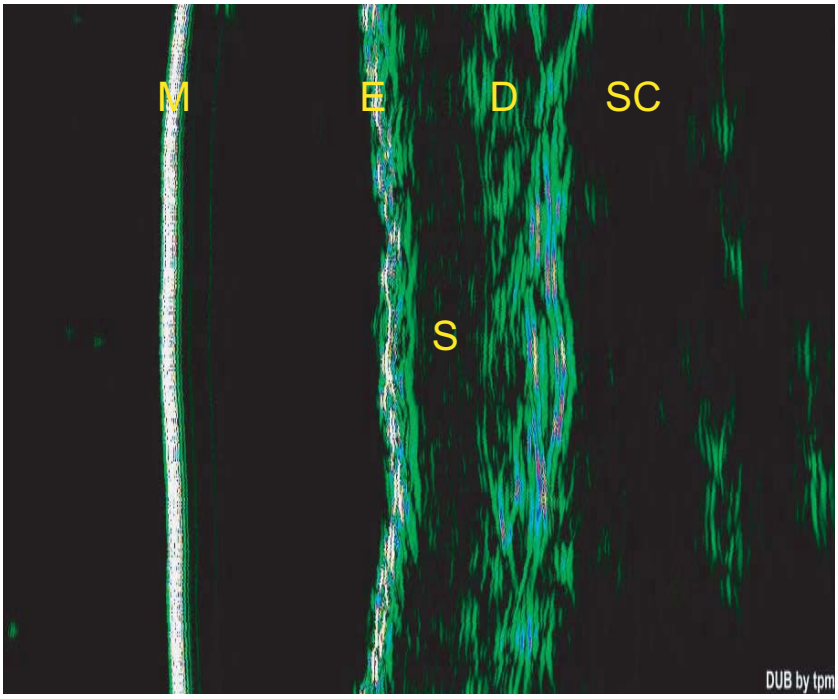


Figure 8.2 Typical ultrasound image of subepidermal low-echogenic band (SLEB) (S) located immediately below the epidermal entrance echo (E)

Unfortunately, no protocols for skin mesotherapy exist, and different treatment modalities have been suggested.[9] The most frequently used agent is hyaluronic acid (HA) in a very fluid formulation. Vitamins and oligoelements may be added to HA.[8,9]

We have conducted a preliminary study to test the efficacy of ultrasound in the evaluation of skin changes following mesotherapy.

Two females of 64 and 58 years, with moderate signs of skin aging of the back of the hand, were treated with multiple injections of non-animal stabilized HA at a concentration of 20 mg/ml (Restylane Vital) at 0, 2 and 4 weeks. Ultrasound evaluation was performed during each treatment and 7 days after. At baseline, ultrasound showed in both patients the presence of SLEB (Figure 8.3). After 5 weeks, in both cases, an increased SLEB echogenicity was evident (Figure 8.4). The two patients showed better skin texture following treatment. Follow-up is still in progress. Interestingly, ultrasound evaluation provided some useful information. Immediately after HA injection, ultrasound showed the absence of the normal structure of the skin due to the presence of a microwheal resulting from microinjections (Figure 8.5). This was observed at each treatment, and generally the skin architecture returned to normal after 4–6 days. The increased SLEB echogenicity that was evidenced at the end of treatment could, in our opinion, be related to an increased density of dermal collagen fibers resulting from treatment.

Our preliminary results have shown that the efficacy of mesotherapy with HA on skin aging can be demonstrated by ultrasound evaluation. A further area of research could be the evaluation of the persistence of such changes after discontinuation of treatment. Accurate follow-up and investigation on larger series of patients are necessary to confirm our findings.

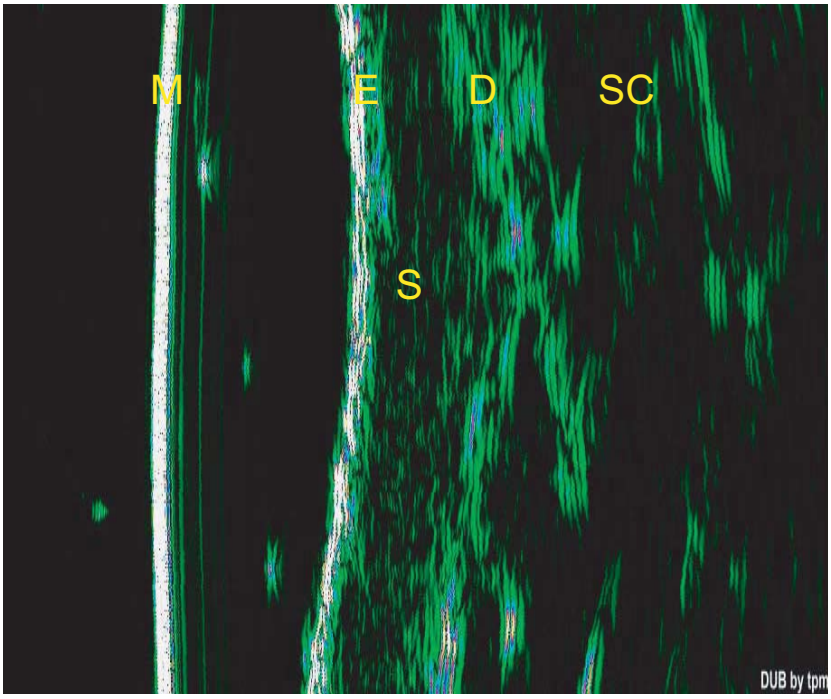


Figure 8.3 At baseline, presence of SLEB in the skin of the back of the hand

Figure 8.4 Evident increased SLEB echogenicity after 5 weeks of mesotherapy

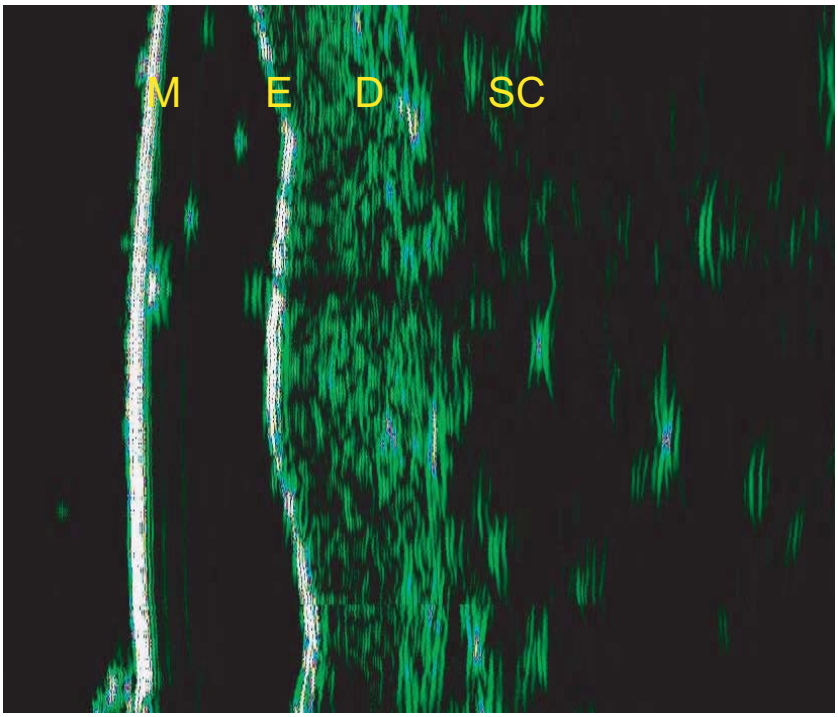
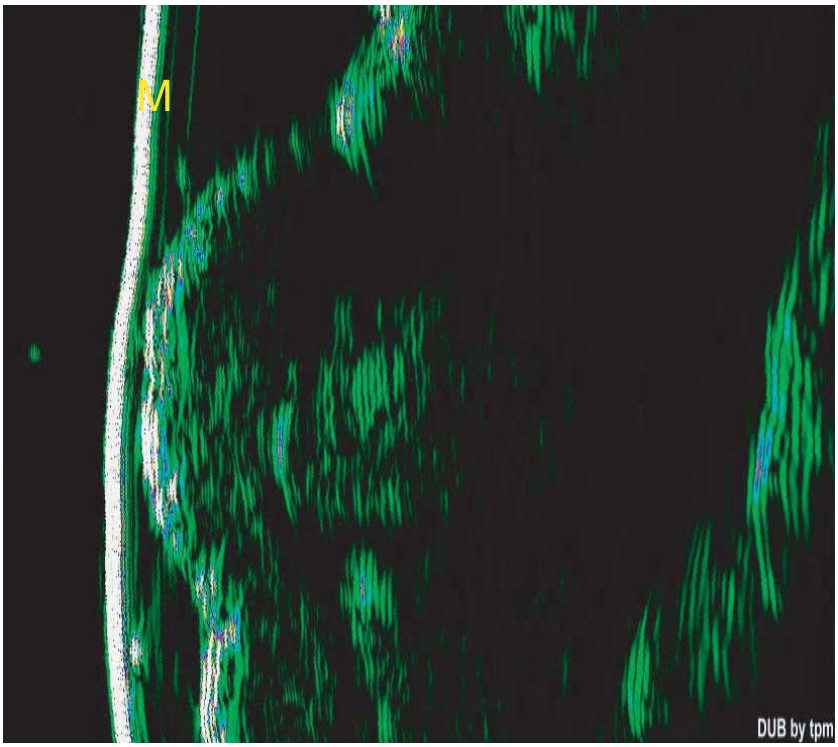


Figure 8.5 Absence of the skin's normal structure due to the presence of a microwheal immediately after microinjections



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9 FACIAL MESOTHERAPY WITH ISOLAGEN AND GROWTH FACTORS

Sandra Swimberghe

Isolagen

Autologous cultured fibroblasts (Isolagen) are a living cellular therapy for the correction of rhytids and scars. Treatment of the dermis with cultured autologous fibroblasts can restore the population of fibroblasts that are reduced as a result of photodamage, aging, and scarring. The potential beneficial effects of replenishing the dermis with autologous fibroblasts have been investigated since 1995.[1]

The process starts with a 3 mm retro-auricular punch biopsy (Figure 9.1). The surgical specimen is placed in a special transport medium tube on ice (Figure 9.2). The donor site is closed with a suture or glue and the specimen is shipped to the laboratory, where the cells

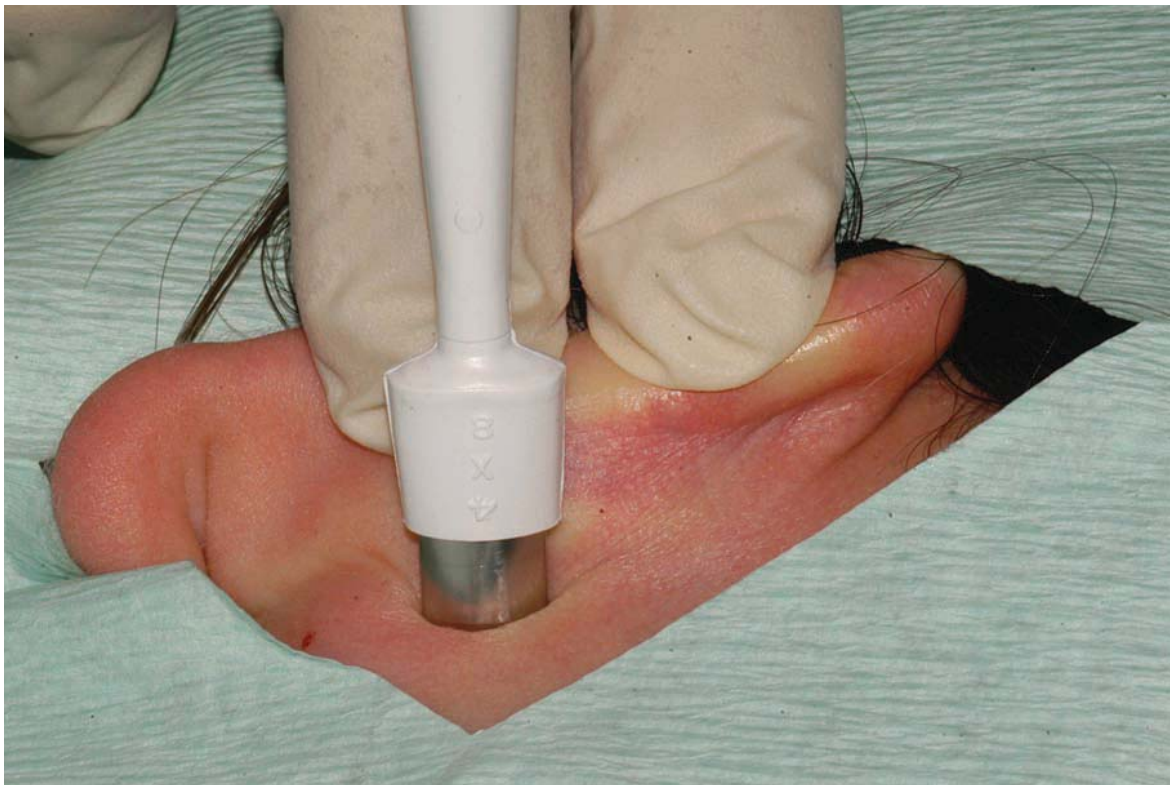


Figure 9.1 The 3 mm retro-auricular punch biopsy

Figure 9.2 Specimen placed in a special transport medium tube on ice

are expanded by proprietary tissue culture techniques. After 12 and 16 weeks, the cultured fibroblasts are shipped back to the treating physician and have to be administered within 24 hours of shipping to ensure a 95% viability of the cultured cells. A course of two treatments with a 30- to 45-day interval between treatments is standard.

In a two-zone treatment, 20×10^6 fibroblasts are injected each time in the area of choice. In a full-face treatment, 30×10^6 fibroblasts are needed to cover the most important areas of the face. Additional areas such as neck, décolleté, and hands can be treated in an extra session. A topical anesthetic cream should be applied to the treatment area to reduce discomfort during injections. Four microfine BD syringes per 1.2 ml are used to aspirate and inject the cells.

Two injection techniques can be used (or a combination of the two).[6] In the threading or retrusion technique, the full length of the needle is inserted into the skin, and the cells are injected while pulling the needle slowly backwards (Figure 9.3). The threads, each approximately 10 mm long, are injected lengthwise and laterally into the wrinkle very superficially, into the papillary dermis, with 0.05 ml of Isolagen per needle length.

In the multiple-puncture technique, multiple injections are placed serially along the length of the treated wrinkle/fold or area. The serial placements should follow the guidelines of 0.05 ml per 2 cm^2.

Ice should be applied after the injections to reduce redness and swelling.

Isolagen has been proven to be effective for rejuvenation as well as reduction of facial wrinkles, lines, and acne and trauma scars. Peri-oral and peri-ocular rhytids respond particularly well (Figures 9.4–9.7). In clinical trials in the USA, 92% of the patients achieved successful results using Isolagen. Patients experience gradual and continued improvement in the course of 12–24 months (Figure 9.8).

Figure 9.3 Threading or retrusion technique

(a) (b)

Figure 9.4 A patient (a) before and (b) after treatment

(a)

(b)

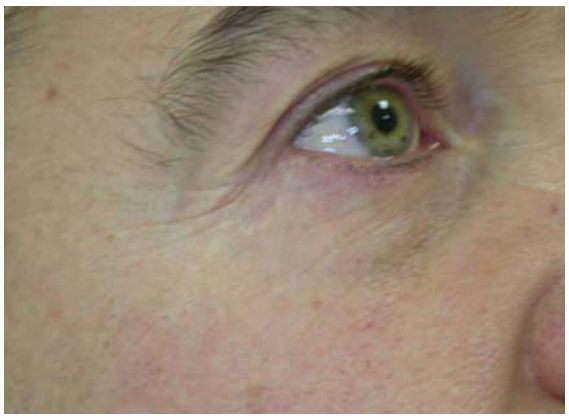
Figure 9.5 A patient (a) before and (b) after treatment

(a)

(b)

Figure 9.6 A patient (a) before and (b) after treatment

(a)



(b)

Figure 9.7 A patient (a) before and (b) after treatment

(a) (b) (c)

Figure 9.8 (a) Before treatment, (b) four months post treatment, and (c) seven years post treatment

The therapeutic correction received is long-lasting, because the patient's immune system recognizes the injected cells as the patient's own and does not reabsorb or reject them, as it does with other foreign materials.

No significant adverse effects have been reported in clinical trials of Isolagen. Minor reactions to the injection include redness and swelling, which resolve within days. Since Isolagen is an autologous system, there is a substantially reduced possibility of allergic reaction. No animal or foreign products are present in the cryovial containing the patient cells.

Growth factors

Human skin is a living organ, which performs dynamic activities such as growth, repair, and maintenance. To maintain these activities, skin requires cytokines and growth factors as key modulators. Generally, the expression levels of cytokines and growth factors, as well as growth hormone levels, decrease with skin aging. When cytokines and growth factors are put into aged skin, this can result in improved skin elasticity and a rejuvenated appearance. Human growth factors and cytokines are now being produced by recombinant engineering similar to the process required for making growth hormone, insulin, oxytocin and erythropoietin. These products are available in various cosmetic forms (cosmeceuticals) as well as in a lyophilized form, which can be used for facial mesotherapy. The following are among the most important products used.

EGF (epidermal growth factor)

EGF is composed of 53 amino acids and can be found in different concentrations in milk, saliva, urine, and plasma, and also in most other body fluids. This protein hastens blood vessel synthesis around damaged parts and drives the secretion of rejuvenating promotional factors. EGF promotes proliferation of fibroblasts, which synthesize collagen and elastin, and epidermal cell growth by driving cell division.

EGF induces biosynthesis of hyaluronic acid through interaction with basic fibroblast growth factor (see below). It controls the generation of most cytokines acting on the skin and affects growth and differentiation of the cell by controlling the generation time of each cytokine.

bFGF (basic fibroblast growth factor)

bFGF promotes cell multiplication and division for the extracellular matrix of the dermis, fibroblasts, neurons, endothelial cells, keratinocytes, chondrocytes, myoblasts, osteoblasts, and many other cell types, and strongly protects neurons. It improves the elasticity of the skin and smoothes out wrinkles by increasing the biosynthesis of collagen and elastin. bFGF can increase the biosynthesis of hyaluronic acid when interacting with EGF and insulin-like growth factor I.

IGF-I (insulin-like growth factor I)

IGF-I is a 7.6 kDa single-chain polypeptide hormone structurally similar to proinsulin. It is involved in the formation of bone, muscle, and nerve tissue, and improves the regeneration of damaged cells. It hastens the biosynthesis of hyaluronic acid.

TRX (thioredoxin)

TRX is a strong antioxidant. It affects cell growth by controlling the DNA-binding ability of transcriptional factors. It increases the manifestation of IL-8 and other cytokines.

Use of growth factors

For facial mesotherapy, cocktails of different growth factors are used – for example, a solution of:

- EGF
- bFGF
- IGF-I
- TRX
- copper peptide
- multivitamins and amino acids

These solutions must be refrigerated and used within days of opening. They can be mixed with lidocaine or derivatives. Different protocols can be found in the literature, according to the type of product used (e.g., once a week for 4–5 weeks, then once every 2 weeks for 2–3 months and once every 1–2 months).

Growth factors can be added to other products used in facial mesotherapy to enhance the effect. The results vary from discreet to moderate, and there is no consensus in the literature regarding products, protocols, or effectiveness.

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Editorial Note

Since this chapter was written, the UK branch of Isolagen has been closed, owing to the very high cost of treatment. The US company will continue to perform patient treatments, but will concentrate on research and development. The treatment should become available again internationally at some point in the future, but there is currently no timetable for this.

10 MESOLIFT, MESOGLOW, MESOSCULPT: IS THERE A DIFFERENCE?

Evangeline B Handog and Ma Encarnacion R Legaspi Vicerra

Mesotherapy

Dermatologists are equipped with knowledge, skills, and technology to improve patients' physical appearance and retard the effects of aging. Research studies and clinical trials continue to develop procedures and products to meet the demands of the aging population. Currently, physicians are rediscovering the benefits of minimally invasive procedures that may eventually match or even surpass the results derived from surgical techniques. With treatment modalities such as mesotherapy, problems such as wrinkles and dry, inelastic, irradiant, and sagging skin can easily be improved by competent hands.

Mesotherapy is derived from the Greek words *mesos*, meaning 'middle', and *therapeia*, 'to treat medically'. It is a procedure of administering multiple painless injections of minidoses of vitamins, minerals, conventional or homeopathic medications, standardized natural plant extracts, and amino acids into the skin and mesoderm. It is an esthetic medical speciality that was given formal recognition by the French National Academy of Medicine in 1987. Presently, thousands of physicians practice mesotherapy throughout the world, especially in Europe and South America.

General indications for mesotherapy

- *Sports injuries:* arthropathy, muscle tear, stress fractures, tendon strain, meniscal tears, plantar fascitis, tendon calcification, tendon degeneration
- *Chronic painful conditions:* bone spurs, carpal tunnel syndrome, chronic low back pain contractures, fibromyalgia, frozen shoulder, ulnar neuropathy, degenerative arthritis, gout, herniated disc pain, neuralgia
- *General medical conditions:* allergies, alopecia, asthma, autoimmune disease, bronchitis, coronary insufficiency, obesity, vascular insufficiency, vertigo
- *Skin conditions:* acne, cellulite, contusions, eczema, keloids, male/female hair loss, obesity, scar, telangiectasias, vitiligo, wrinkles, hyperpigmentation

Esthetic indications for mesotherapy

- Face and neck rejuvenation
- Improving skin texture and appearance
- Firming the skin
- Wrinkle treatment
- Cellulite and 'dimpled' skin
- Localized adiposities
- Body sculpting

Application of mesotherapy

The solution for injection is individually prepared depending on its purpose. Unlike other medical treatments, mesotherapy is administered directly to the desired area. This limits side-effects, reduces the possibility of drug interactions, and allows for a substantial reduction in the amount of medicine utilized for each procedure.

The depth of the injection for facial rejuvenation is usually confined to the epidermis, using a needle length of 4 mm. Injections are usually done very rapidly and superficially at 3-week intervals, and usually up to 10 treatments are given.

Mesotherapy is effective because it helps reverse the physiology of numerous conditions. It acts through a localized reaction that is cutaneously induced – tissue modifications caused by the pharmacologically active substances injected locally and possible stimulation of immunity have been postulated.

Materials

The compounds injected into the skin and mesoderm during mesotherapy depend upon the pathophysiology of the disease process. In general, the substances fall into the following classes: vasodilators, anti-inflammatories, muscle relaxants, decontractants (which reduce contractures), proteolytic enzymes, 'biologicals' (including vitamins, minerals, and plant extracts), hormones, hormone blockers, anesthetics, and other medically active substances.

Risks of mesotherapy

The majority of known risks of mesotherapy concern the injection site and the surrounding area and are minimal because low doses of compounds are injected into a relatively small area. These risks are:

- skin can become pigmented
- inflammation, swelling and bruising, usually subside after treatment
- allergic reaction to injected drugs
- infections due to poor injection practices – see below
- unregulated use of mesotherapy compounds not approved by the Food and Drug Adminstration in the country of source pose risks to potential patients
- Financial risks since mesotherapy is not covered by health insurance plans.

Note: Infections have often been reported in patients of unlicensed mesotherapy practitioners. These infections may require treatment with expensive antibiotics. A recent study by Rivera-Olivero et al[1] on soft tissue infection following mesotherapy between March 2002 and December 2003 in Caracas, Venezuela showed the possibility of late-onset skin and soft tissue infection by nontuberculous mycobacteria. More recently, the US Centers for Disease Control and Prevention (CDC) reported an outbreak of mesotherapy-associated skin reactions in the District of Columbia area from January to February 2005: there were 14 prolonged skin reactions in 14 patients. The CDC have provided recommendations for practices related to mesotherapy.[2]

Mesolift

Mesolift is defined as a mesotherapy procedure that focuses on minimizing wrinkles and improving skin tone and elasticity. It may help or decrease wrinkles and 'crepe skin' in the facial and décolleté areas, improve skin tone and texture, and enhance skin contour and subtly lift sagging skin in the face and neck. Hence, mesolift can defy the aging process. Although not a substitute for a facelift, this treatment can give a fresher, healthier look. Skin circulation decreases with age, resulting in reduction of oxygen and nutrients, which hampers the body's ability to flush out free radicals. This causes skin aging and results in the skin developing an ashen appearance.

Wrinkles, like other conditions involving the skin, have a multifactorial etiology. Excessive skin wrinkles or rhytides can be caused by overall dehydration, excessive sun exposure, genetics, facial expressions, muscle atrophy, fatty acid deficiencies, hormone imbalances, nutrient deficiencies, and many other causes. As with cellulite treatment, it is best to utilize mesotherapy for wrinkles in the context of a comprehensive natural medicine program to correct some of the above causes. For the person with stress and increased muscle contraction in the forehead, botulinum toxin injections can be given. Excessive wrinkles can also be a sign of advanced or aggressive aging, which emphasizes the need even more to utilize mesotherapy, alongside regenerative therapies, natural hormone replacement, nutriceuticals, an appropriate metabolic-type diet, and other mid-life medical measures.

The mesolift process delivers a combination of hyaluronic acid, highly concentrated vitamins, trace elements, coenzymes, amino acids, and antioxidants (Boxes 10.1–10.5) directly into the skin to nourish and rejuvenate, promote production of collagen and elastin, and stimulate metabolism. It can improve the circulation in the tiny blood vessels of the skin, thereby strengthening the structure and restoring the firmness of the skin.

After treatment, patients commonly describe their skin as looking rested, radiant, and firmer. Mesotherapy can be used as a supplement, or an alternative, to many anti-aging regimens, including botulinum toxin, laser resurfacing, peels, antioxidants, topical creams, and facelifts.

Indications for mesolift

- Improvement of sun-damaged skin
- Improvement of skin quality: elasticity and skin turgor
- Reduction of wrinkles
- Revitalizing tired skin/improvement of skin slackening
- Replenishing nutrient-robbed skin

Mesolift allows true restructuring of the skin tissue, since the formulation is designed to favor the different biological reactions of the architecture of the skin:

- Vitamins provide an antideficiency function.
- Amino acids allow better protein construction.
- Minerals guarantee the ionic balance of the medium.
- Coenzymes activate biochemical reactions.
- Nucleic acids stimulate synthesis.

BOX 10.1 MICRONUTRIENTS FOR MESOLIFT AND THEIR ACTION

Micronutrient	Action
Vitamins:	
A	• Acts on flexibility of the skin by regulating growth of epidermal cells • Helps restore collagen and elastin
B5	• Involved in cellular production of energy • Needed for hormone synthesis
C	• Helps stimulate collagen synthesis • Inhibits melanin synthesis
D	• Indispensable for calcium metabolism
E	• Antioxidant • Fights formation of toxic peroxides
K	• Plays a major role in regulation of microcirculation
Amino acids	• Basis of tissue architecture of the skin (components of proteins)
Minerals	
Silica	• Needed to maintain ceramide matrix
Zinc	• Protects against free radicals and helps cell reproduction • Needed in repair processes
Coenzyme Q10	• Antioxidant that protects against free radicals • Assists in energy production, which in turn assists healing
Cytokines (EGF, bFGF)	• Stimulate cell functions in aged skin
Copper peptide	• Increases biosynthesis of collagen and elastin • Needed to increase natural tissue-building process • Helps firm, smooth, and soften skin
Nucleic acids	• Necessary for protein synthesis
Glutathione	• Powerful antioxidant formed in liver

BOX 10.2 VITAMIN C COCKTAIL FOR MESOLIFT

Active components	Vitamin C	3 cm^3
	Saline solution	2 cm^3
	Procaine 2%	1 cm^3
Indications	Photoaging Melasma Sun damage	
Frequency	Use vitamin C once/week	

BOX 10.3 GLUTATHIONE COCKTAIL FOR MESOLIFT

Active components	Glutathione	5 cm^3
	Vitamin C	1–2 cm^3
	Glycolic acid or pyruvate	1 cm^3
Indications	Photoaging Melasma Sun damage	
Frequency	Use vitamin C once/week	

BOX 10.4 HYALURONIC ACID PLUS VITAMIN C COCKTAIL FOR MESOLIFT

Active components:		
Phase 1	Hyaluronic acid (HA) 3.5%	2 cm^3
Phase 2	Vitamin C	2 cm^3
	Procaine	1 cm^3
	Aminomethylsilanetriol + DMAE	2 cm^3
Treatment	Remove 2 cm^3 out of 7cm^3 diluted HA to mix with Phase 2 solution	

BOX 10.5 HYALURONIC ACID PLUS VITAMINS C AND A COCKTAIL FOR MESOLIFT

Active components:		
Phase 1	Hyaluronic acid (HA) 3.5%	2 cm^3
Phase 2	Vitamin C	2 cm^3
	Procaine	1 cm^3
	Aminomethylsilanetriol + DMAE	2 cm^3
	Vitamin A	1 cm^3
Treatment	Remove 2 cm^3 out of 8 cm^3 diluted HA to mix with Phase 2 solution	

Methodology of mesolift

- An analysis of the face is performed by the physician to determine the areas to be addressed.
- The patient is advised to wash the face before the procedure.
- The face is then degreased using 70% isopropyl alcohol.
- The face is dried and topical anesthesia (e.g., Emla or another lidocaine mixture) may be applied if the patient is very sensitive to needle pricks or has a very low tolerance to pain.

- Injection points are plotted on the face in a symmetrical fashion.
- The points are as follows: periocular, glabellar, cheek area, jowl area, perioral, neck area, legs, abdomen, arms, hands.
- The injection technique may use fine needles in a 'pont-du-pont' or nappage approach or intradermal injections, which should be at a depth of no more than 1–2 mm.
- Adjuvant treatments after mesotherapy injection may include the use of chemical peels and other medicines.
- To enhance the absorption of the medicines, a galvanic current may be applied for 10 minutes to the affected area.

Mesolift can involve between 8 and 300 shots, depending on the condition and amount of area covered. The multipricking technique involves rapid superficial injections, taking less than a couple of minutes, thereby maximizing the area stimulated. This is often necessary for conditions such as cellulite, wrinkles, and hair loss, where the maximum area must be stimulated to produce a good result.

The number of treatments needed depends upon many variables, including the condition, the abnormal physiology causing the condition, and the chronicity of the problem. A minimum of three to five sessions of mesotherapy are generally given to produce a response. For long-term chronic conditions such as cellulite and wrinkles, at least 15 sessions of mesotherapy will be needed.

Frequency of treatment with mesolift

The frequency of treatment varies, depending on:

- type of medicine to be used
- age of patient
- degree of sun exposure
- race of patient
- hereditary factors

The frequency schedules are:

- every 2 weeks for 6–8 visits
- every week for 7–10 visits
- every month, with no time limit

The expected results/outcome are:

- generally plumper and clearer skin
- fewer wrinkles
- complexion evens out in color
- skin becomes radiant and glowing, looking younger, rested, and revitalized

Other products used for facial rejuvenation

Ammonium lactate

- This alpha-hydroxy acid (AHA) derivative (2%) helps hydration of the skin.
- It augments glycosaminoglycans.

DMAE (dimethylamine ethanol)

- This is commonly used in topical formulas for antiaging.
- It acts at the neuromuscular junction as a precursor of acetylcholine, the neurotransmitter responsible for muscular contraction, increasing the overall tone of the skin.

Thymomodulin

- This is extracted from the thymus gland.
- It is an immunomodulator that increases T lymphocytes, CD3, CD4, and CD8 cells, and neurotrophic functions, and regulates levels of immunoglobulins A and G.
- It is effective in erasing smoker's lines and cleansing the skin of harmful pollutants such as smoke.
- It helps reverse photoaging.

Alpha-lipoic acid

- This is a powerful antioxidant.

Asian centella

- This helps in strengthening the capillaries and veins and in so doing assists with better blood circulation.
- It stops the formation of fibers that trap fat cells in cellulite and improves the flexibility of the connective tissue.
- It is used in repigmenting stretchmarks. It can cause allergic reactions and hyperpigmentation (the same property that makes it effective in treating stretchmarks).

Glycolic acid

- This is the most commonly used AHA.
- It works by stimulating new growth of skin and collagen and by decreasing the bonds that hold dead skin cells to the surface.

Hyaluronic acid

- This natural substance is found in all living organisms.
- It is indicated for the treatment of aged and dehydrated skin.
- It has a high affinity for water.
- A nonstabilized form is used in mesotherapy.
- It is used for tissue hydration, lubrication, and smoothness, and for softening and decreasing wrinkles on the face, neck, and scalp.

Piruvato sodico

- This is involved in the synthesis of amino acids.
- It enhances weight loss.
- It stimulates collagen synthesis.
- It acts synergistically with L-carnitine.

Vitamin C

- This plays a role in collagen formation.
- It is a key immune system nutrient.
- It has potent activity against free radicals.

Aminomethylsilanetriol

- This is lipolytic.

- It helps to 'burn' fat by activating lipases together with the methylxanthines such as caffeine, theophylline, etc.

Mesoglow

Mesoglow is defined as mesotherapy procedure using specific cocktails of vitamins and antioxidants to even out skin color and improve the complexion. (Box 10.6). The skin becomes radiant and glowing. Aside from the expected benefits of the antiaging ingredients, collagen and elastin production are mechanically stimulated by the injections themselves. The treatment frequency is typically every 2 weeks for about 6–10 visits, depending on the specific needs of the patient.

BOX 10.6 MESOGLOW COCKTAILS

Active components:

Cocktail 1	Superoxide dismutase	1 cm^3
	Gluthatione	1 cm^3
	Vitamin C	1 cm^3
Cocktail 2	Argireline	1 cm^3
	Vitamin C	1 cm^3

Materials for mesoglow

- Glutathione: a powerful antioxidant
- SOD (superoxide dismutase): prevents melasma
- Vitamin C: an antioxidant
- Argireline: helps wrinkle reduction

Mesosculpt

Mesosculpt is a mesotherapy procedure in which phosphatidylcholine alone or in combination with other materials (Boxes 10.7–10.10) is administered to effect weight loss, to remove localized adiposities and cellulite, and to contour specific undesired fat pockets. Common areas of the body that can benefit from mesosculpting are the face, neck, abdomen, thighs, buttocks, and arms. On the surface of each of the body's fat cells are receptors: those that burn fat are known as beta receptors and those that cause fat storage are known as alpha receptors. Alpha receptors are stimulated by carbohydrates, fat ingestion, amino acids, and alcohol.

In facial rejuvenation procedures, mesosculpt may be used to reduce or eliminate fat pads under the eyes that look puffy. Reduction of double chin, decreased jowls, and rotund buccal fat pads may result in a leaner, younger-looking face and neck.

In a study by Rittes[3] on the use of phosphatidylcholine for the correction of lower-eyelid bulging due to prominent fat pads, the results showed a marked reduction of lower-eyelid fat pads over the 2-year follow-up period. There were no recurrences. Post-treatment results were as natural in appearance as those obtained from surgical procedures.

BOX 10.7 PHOSPHATIDYLCHOLINE PLUS AMINOMETHYLSILANETRIOL COCKTAIL FOR MESOSCULPT

Active components	Phosphatidylcholine	5 cm^3
	Aminomethylsilanetriol	5 cm^3
Indications	Eyebags	
	Lipodystrophy (buffalo hump)	
	Fat deposits on shoulders	
	Double chin: but not sagging skin	
	Fat on abdomen	
	Lipoma	

BOX 10.8 PHOSPHATIDYLCHOLINE PLUS PYRUVATE COCKTAIL FOR MESOSCULPT

Active components	Phosphatidylcholine	5 cm^3
	Pyruvate	2 cm^3
Indications	Arms	
	Lower and upper abdomen	
	Double chin	
	For patients with allergy to salicylic acid or who cannot use cocktail with organic silicones	

BOX 10.9 PHOSPHATIDYLCHOLINE PLUS L-CARNITINE COCKTAIL FOR MESOSCULPT

Active components	Phosphatidylcholine	5.0 cm^3
	Triiodothyroacetic acid + L-carnitine	2.5 cm^3
	Aminomethylsilanetriol	2.5 cm^3
Indications	Upper and lower abdomen	
	Double chin	
	Arms	

BOX 10.10 PHOSPHATIDYLCHOLINE PLUS RUTIN PLUS MELILOT COCKTAIL FOR MESOSCULPT

Active components	Phosphatidylcholine	5 cm^3
	Aminomethylsilanetriol	5 cm^3
	Rutin and melilot	2 cm^3
Indications	Legs with varicose veins	
	Fat on thighs	

In another study by Ablon and Rotunda,[4] the results showed that injectable phosphatidylcholine resulted in improvement of fat herniation in the lower eyelid in 80% of cases, with persistence of results in 50% of patients within a 9-month period. It was therefore proposed that injectable phosphatidylcholine may benefit patients who are considering blepharoplasty.

Not much literature is available on mesosculpt for double chin and jowls. Although this procedure is commonly performed, proper documentation and further research have yet to be published. Mesosculpt treatments are typically given once per week. As improvement is seen, the treatments may be given less frequently, such as once every 2 weeks or once per month. An appearance of overall weight loss, development of self-esteem, and a motivation to change lifestyle make the practice of mesosculpt very popular today.

Materials for mesosculpt

Phosphatidylcholine

- This antioxidant is derived from natural soy lecithin.
- It alters the metabolism of fatty substances such as cholesterol and triglycerides in the body.
- It is an excellent 'fat burner'.

L-Carnitine

- This is required for fatty acids to be delivered into cells, where the fat can be burned as a source of fuel.
- Diet and exercise along with L-carnitine will maximize fat removal.

Caffeine

- This alkaloid increases blood flow and stimulates fat cells to release fat into the blood stream to be burned by the body's metabolism.
- It acts to drain the fat cells.
- It tightens and tones the skin.

Aminophylline

- This stimulates the release of fat into the bloodstream.
- Its effectiveness is similar to that of caffeine.
- However, it is less stable and must be kept in a cool place and used quickly.
- It allows beta receptors to burn the fat more efficiently

Yohimbine (iombina)

- This is an alkaloid found in the inner bark of a tree that grows in South Africa (*Corynanthe yohimbe*).
- It is excellent for targeting localized fat.
- It is an alpha-2 antagonist enhancing beta-receptor activation.
- It has a lipolytic effect, primarily for lower-body fat in females, but can be used abdominally and in males.

Triiodothyroacetic acid

- This is an excellent fat burner.

Products used for improving the circulation and vascular system

Benzopirone

- This has powerful lymphotrophic action.
- It can significantly reduce edema of vascular origin.
- It is mainly used to improve the absorption of other drugs, especially into the lymphatic system.

Buflomedil

- This works directly as a vasodilator; it is a phosphodiesterase enzyme inhibitor that stimulates cyclic adenosine monophosphate and biological vasodilators.

Ginkgo biloba

- Ginkgo flavonoids directly dilate the smallest segment of the circulatory system – the microcapillaries, which increases both blood circulation and oxygen levels in the brain as well as in other critical organs.
- Ginkgo is a highly important antioxidant shown to have a special affinity for scavenging the superoxide radicals.

Pentoxifylline

- This increases erythrocyte flexibility and decreases blood viscosity.
- A vasodilator, it improves microcirculation and tissue oxygenation.

Rutin

- This has antioxidant, anti-inflammatory, anticarcinogenic, antithrombotic, cytoprotective, and vasoprotective activity.

Melilotus

- This has anti-inflammatory and anti-edematous activity.
- It is used in preventive treatment of varicose veins and natural thrombophlebitis.
- It increases capillary and venous tone, and causes vasodilation and lymphatic drainage.

Mesotherapy – yes or no?

Mesotherapy has been safely performed for over 50 years throughout Europe and South America, and more recently in the USA. Unlike liposuction and other cosmetic surgery procedures, there has never been a patient death associated with mesotherapy. The *American Journal of Mesotherapy* has emerged in the past year, with evidence-based research supporting the clinical efficacy and effectiveness of mesotherapy. The American Board of Mesotherapy provides specialty board certification in mesotherapy. Standards of training, clinical experience, and skill are required for completion of this certification (see figures below).

However, very little scientific and/or clinical evidence has yet been published in support of mesotherapy; there also appears to be no standardization within the practice in terms of what substances are used, the quantities used, and the amount and frequency of injections.

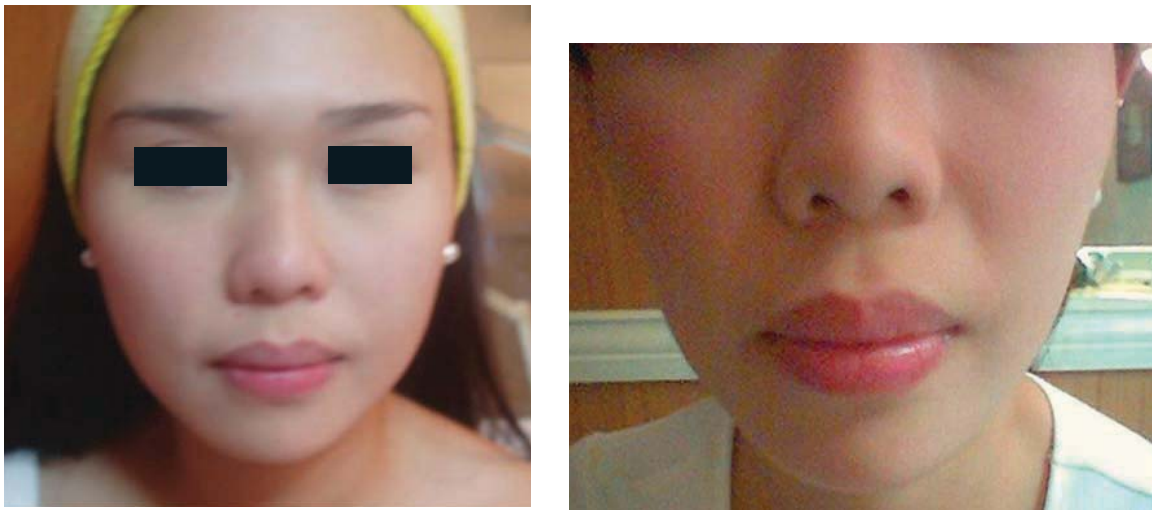
In summary, the advantages of mesotherapy include its nonsurgical approach, minimal pain involved, fewer complications, and less downtime. Based on experience-based medical findings of physicians worldwide in the growing field of mesotherapy, we expect more innovative and emerging nonsurgical treatment modalities that would offer perhaps a safer and more cost-effective alternative treatment for skin rejuvenation.

(a) (b)

Figure 10.1 (a) 70 year old female, baseline. Treated for skin laxity, pigmentation and skin rejuvenation. Monthly interval for treatments. (b) Photograph after six treatments using mesolift and mesoglow cocktail. Skin is clearer, firmer and has less wrinkles

(a) (b)

Figure 10.2 (a) 53 year old female, baseline, Treated for uneven pigmentation and skin rejuvenation. Three weeks interval for treatments. (b) Photograph after four treatments using mesolift and mesoglow cocktail. Youthful appearance achieved with firmer, fairer and fuller skin



(a) (b)

Figure 10.3 (a) 26 year old female, baseline, revealing full cheeks. Mesosculpt cocktail has been used at two weeks treatment interval. (b) Higher magnification of photograph after five treatments. Cheeks are slimmer and face has a more chiselled appearance

(a) (b)

Figure 10.4 (a) Baseline photograph of a 65 year old female who had mesosculpt for double chin performed at two weeks treatment interval. (b) Result after five treatments. Debulking of jowls, slimming of jaw line and smoother angle of neck profile can be noticed

(a) (b)

Figure 10.5 (a) Mesosculpt of fat deposits of lower eyelids. Baseline photograph of 51 year old female. (b) Results after one visit at two weeks interval. Fat deposits are flattened out significantly

(a) (b)

Figure 10.6 (a) 42 year old female treated for lower eyelid fat deposits and jowls and skin rejuvenation. Mesosculpt and mesoglow cocktail have been used at two weeks treatment interval. (b) Results after four treatments, fat deposits are flattened out, jowls are diminished and skin is clearer

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INDEX

N.B. Page numbers in italic denote figures or boxed material.

Atlas of MESOTHERAPY in Skin Rejuvenation

Mesotherapy for skin rejuvenation can be performed in different body areas, such as the face, neck, hands and the inner surface of both arms and legs, to activate dermal fibroblasts and to hydrate the skin, thus giving the treated areas more luminosity and fullness. This easy-to-follow Atlas is a practical guide with color illustrations that gives the reader full information about when and how to perform the procedures involved.

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