Chapter II

Basic Science of the Aging Face
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If, as physicians certified in the SpaMedica® lift, you are to deliver consistent, high quality youthful, non-surgical rejuvenation of the face, it becomes paramount that you first understand how the soft-tissue and bony structures of the face actually age. Once one understands the aging phenomenon of the skin, one begins to understand how to reverse and rejuvenate the process. The soft-tissue envelope of the face consists of several layers and the SpaMedica® lift addresses each of these aging components separately. Each layer of the skin and facial soft-tissue envelope ages in its own characteristic fashion. The layers of the aging face that we will examine closely in our exploration of the aging process include the:

**Epidermis:** This is the outermost layer of the skin. The outermost layer is comprised of a dead, scaly outer layer of “cell remnants”, called the Stratum Corneum.

**Dermis:** Just under the epidermis, this layer contains the mesodermal skin components, the blood vessels, nerves collagen, elastin and ground substance, as well as sweat glands and hair follicles.

**Subcutaneous:** The subcutaneous, or fatty layer, lies under the dermis and is comprised of fat, vessels, nerves and connective tissue fascial elements.

**Muscle:** The underlying facial and neck muscles attach at their origins to bony regions of the facial skeleton and insert into the dermis at certain fixation points in the face, via fibrous, fascial attachments.

The underlying facial and cervical muscles create mass action motion of the overlying facial soft-tissue via their fascial dermal attachments. The resting tone, bulk and structural strength of the facial muscles and the integrity of the fascial attachments (retaining ligaments) maintain the youthful, vertical position and Ogee of the soft-tissue envelope.

**Bone:** The facial skeleton is comprised of the maxilla, mandible, nasal cranial and orbital bones.

Certainly as we age there are characteristic and common histological changes that occur within each layer of the skin. The SpaMedica® lift attempts to deliver efficacious and clinically evident rejuvenative therapy to each of the soft-tissue layers to create a more youthful appearance to the face, which simulates some of the enhancements one might witness with a well done surgical face and neck-lift. The cumulative effect of a moderate youthful reversal of the aging features of each layer of the facial soft-tissue envelope results in a global return to a more youthful facial cutaneous appearance.
There are two general mechanisms by which the facial soft-tissue ages:

1. True Non-Environmental Aging

The soft-tissue aging that occurs in true, non-environmental aging is universal and inevitable. The changes that one witnesses are due to the passage of time alone. This aging has only subtle morphological features, but significant physiological characteristics that define it.

2. Photo Aging

This is the skin and soft-tissue aging seen with chronic and often habitual exposure of the skin to the sun. This kind of aging has both significant physiological and morphological findings associated with this form of skin and soft-tissue aging.

1. True, Non-Environmental Soft-Tissue Aging

The major clinically evident features of normal age-related skin include:

(i) “Dryness”
(ii) Roughness
(iii) Wrinkling
(iv) Laxity

2. Photo Aged Skin (Actinic Damage)

(v) “Dryness”
(vi) Roughness and Hyperkeratosis
(vii) Hyperpigmentation and Dyschromia
(viii) Diffuse Telangiectasia
(ix) Elastosis
(x) Fine and Deep wrinkling

To be successful, the SpaMedica® lift should be able to improve, enhance and rejuvenate both forms of facial cutaneous aging. In reality, with our depleted ozone layer, most Fitzpatrick skin types 1–3 have suffered from some cumulative photo aging and the clinical, as well as the histological process of cutaneous skin and soft-tissue aging is a combination of True, Non-environmental Aging and Photo Aging.

To gain a true appreciation of the facial soft-tissue aging process and how the SpaMedica® lift impacts upon and helps to reverse the process, will we examine the specific aging histological and morphological changes at each level of the soft-tissue envelope and the beneficial effects of the SpaMedica® in combating, or reversing this process.
Let us now examine each of the layers of the skin that is undergoing true, non-environmental aging and the histological and clinical finding that manifest.

**The Epidermis**

With aging, there is a striking flattening of the dermal-epidermal junction with effacement of the dermal papillae and epidermal rete pegs and an accompanying 50%, or greater, reduction in the number of these interdigitating papillae and pegs per unit skin surface length. This flattening effect is a gradual process, occurring between the third and ninth decades. This measurable loss of surface contact between the two compartments and anchoring of the epidermis to the dermis, likely results in decreased nutrient transport to the epidermis, slower epidermal turnover and transit time and the associated dry, scaly epidermal skin that is apparent in aged skin. With the diminished epidermal anchoring, there is also a propensity to loss of epidermal integrity with minor trauma.

Although the average thickness of the epidermis and stratum corneum appears to remain proportionately the same as we age, individual keratinocytes get progressively larger as we age and there is a striking decrease in the epidermal turnover, or shedding of the stratum corneum, as measured by thymidine labeling. As we age, there is a 100% prolongation in the stratum corneum replacement rate. This slow stratum corneum turnover, may account for the xerotic (dry), sallowed, dull, rough, hyperkeratotic texture of aging skin.

There is a significant decrease in the epidermis’s ability to protect the skin against ultraviolet light damage. As we age there is a dramatic drop in the number and proportion of enzymatically active melanocytes in the basal layer of the epidermis. In addition, there is likely a decrease in the absolute number of basal melanocytes. As a result of these changes the skin is less able to protect against UV damage. Photo aged skin tends to progress exponentially as we age as these defense mechanisms are attenuated.
Aging skin has progressively fewer Langerhans cells, accounting for some of the diminished immune responsiveness of the aging skin. Finally, there is diminished endocrine function of the skin as we age manifested by decreased Vitamin D production.

The Epidermis and the SpaMedica® lift
Morphologically and clinically, the epidermis, although the same thickness in absolute terms, is thicker relative to the aged and thinning underlying dermis. Further, the epidermis contains larger keratinocytes in the stratum corneum, which then turn over very slowly. These histological changes account for the relatively dry, scaly, thicker, sallower-yellowish pallor to the aging skin, with a rough and irregular texture. The characteristic xerosis, or the “dry,” thick scaly skin is likely attributed to the slower transit time of keratinocytes through the stratum corneum. Superimposed upon this picture is often some degree of photo aging and a diminished ability to protect against UV light and sun damage, which I will deal with separately at the end. The SpaMedica® lift, with its SonoPeel® and CaviFacial™, optimally rejuvenates and helps reverse and combat these aging epidermal changes.

The Dermis
In non-photo aged skin, there is a significant thinning of the dermis as we age. The dermis thins by 20–30% by the age of eighty years old. The remaining dermis is less cellular and less vascular. There is a marked decrease in the number vertical capillary dermal loops into the dermal papillae and an overall decrease in the vascularity of the skin as we age. This loss of dermal vascularity is likely connected to the aging process of the skin, with a decreased nutrient support to the cellular milieu. There is also a significant decrease in the density of the vascular bed surrounding the hair follicles, eccrine and apocrine sweat glands as we age, which accounts for their diminished function in aging skin. Eccrine gland sweat function in response to dry heat decreases by 70 percent by the 7th decade.

There is a decrease in the vascular responsiveness of the dermis and a significantly decreased ability for transdermal drug absorption. The slower transdermal transportation and absorption results in a decreased ability for transdermal, medically active skin care products applied passively on the skin, to have a beneficial effect. The dermal penetration of medical skin care products is made worse by a thickened stratum corneum in the aged skin and the insoluble barrier it forms. There is a dramatic loss of melanocytes from the hair bulb, resulting in progressive graying of the hair. In males, androgen dependent conversion of terminal, to vellus hairs and subsequently baldness occurs with aging.

There are significant histological and biochemical changes in dermal collagen, elastin and ground substance. As skin ages, the amount of soluble collagen decreases profoundly and the proportion of insoluble, cross-linked collagen increases, with less elasticity and loss of tensile strength. Elastin fibers show progressive cross-linkage and calcification with age. There is also a decrease in the mucopolysaccharide ground substance (glycosaminoglycan and proteoglycan) content of the skin. Not only are the ground substances the compounds in which collagen are embedded, but they also help account for hydrophilic hydration of the dermis.
As the facial skin and soft-tissue envelope ages there are permanent and distinct wrinkles that appear all over the facial skin, but accumulate most noticeably in the region of the face where there are more animated facial muscles. The accordion-like effect of the underlying muscle and its fibrous attachments to the overlying dermis result in permanent fissuring and wrinkling of the dermis. Fine wrinkles have few, if any, histological findings. Deep wrinkles demonstrate contraction of the fascial bands that attach the fat to the overlying dermis.

Mechanically, there is a loss of elasticity and elastic recoil of the skin as we age. The picture of photo aged skin is quite different from the non-sun damaged surfaces and will be addressed separately at the end of this chapter.

**The Dermis and the SpaMedica® lift**
Morphologically and histologically, the overall picture of the aging dermis is one where the dermis becomes thinner, less vascular, less elastic, rigid and less able to support the aging soft-tissue envelope of the face. The SpaMedica® lift, with its SonoFacial® and injectable filler program addresses, reverses and rejuvenates much of the aging effects found in the dermis. For the aging face that has suffered from significant photo aging, the SpaMedica® Plus offers FotoFacial RF® therapy, in addition to the SonoPeel®, Cavifacial™, SonoFacial® and MyoFacial® to address the specific aging effects found in sun damaged skin.

**The Subcutaneous Fat**
As the soft-tissue envelope ages, with or without photo aging, there is a characteristic and variable atrophy and loss of the subcutaneous fat. As the face ages, there is an involution or deflation of the subcutaneous space. The loss of facial and body fat results in a loss of the youthful fullness to the face. The involutorial fat atrophy of aging results in loss of cheek volume and contour, hollowing of the orbital sockets, exaggeration of the deep ruggae of the lips, smile lines and facial rhytides. There is often a significant loss of lip volume and hollowness to the mid-buccal cheek space.

**The Subcutaneous Fat and the SpaMedica® lift**
The SpaMedica® lift incorporates a comprehensive soft-tissue rejuvenation program that includes selective use of injectable fillers into the regions where there are furrows, fissures, wrinkles and soft tissue defects, to provide a consistent appearance of youthful vitality.

**The Facial Muscles**
As we age, the muscle fiber thickness and absolute number of muscle fibers decreases, resulting in facial animation muscles that weaken with age. Further, the soft-tissue fascial attachments binding the overlying skin to the muscle attenuate and lengthen and are less able to support the weight of the soft-tissue envelope and the face droops. The loss of muscle tone, fiber size, number and integrity results in a descent of the facial soft-tissue envelope. Clinically, this facial muscle flaccidity and descent is manifested by brow ptosis and the resulting upper lid fullness, mid-facial,
cheek fat-pad ptosis, jowl laxity and loose skin of the neck. For any non-surgical facelift procedure to be successful it must have a significant strengthening and elevating effect on the muscular layer of the face and neck, which in turn, must elevate and reposition the ptotic soft-tissue envelope.

The Facial Muscles and the SpaMedica® lift

The Isotonic MyoFacial® therapy delivers muscle hypertrophy, re-education and rejuvenation through a patented process of MyoFacial® Hypertrophy. A MyoFacial® is a process of facial muscle hypertrophy delivered through isotonic, resistive, load bearing exercises of the specific facial muscle elevators. As long as the fibrous, fascial network connecting the ptotic skin to the flaccid facial muscles is intact, then the MyoFacial® process will demonstrably and clinically result in strengthening and tightening of the underlying supportive effect of the facial muscles and a visible elevation of the soft-tissue envelope.

Special Clinical Circumstances:

The SpaMedica® lift is designed to rejuvenate all aging facial skin types on its own, without any adjunctive technology or therapy. However, there are many clinical situations where photon based rejuvenation, in the form of a FotoFacial RF® skin rejuvenation may also provide additive rejuvenation effects to those that the SpaMedica® lift can deliver on its own. For these patients, I prescribe the SpaMedica® Plus, which includes all the therapies in the SpaMedica®, with the addition of FotoFacial RF® skin renewal. Depending upon where you practice, sunbelt or temperate regions, over 80% of your SpaMedica® lift patients will need FotoFacial RF®, or some form of non-ablative photorejuvenation. The following clinical presentations will benefit most from the SpaMedica® Plus:

1. Photo Aging
2. Fitzpatrick Skin Types 4 & 5 with Hyperpigmentation
3. Rosacea
4. Diffuse Dyschromia
5. Fine–moderate wrinkles
6. Combinations of 1–5

1. Photo Aging

As we have seen above, there are characteristic morphological and histological changes associated with non-environmental skin aging. Chronic sun-damaged skin, or photo aged skin, has traditionally been mislabelled in the lay press and medical literature as “aged skin”. Photo aged skin shares many of the subtle aging findings found in non-environmentally aged skin, but has, superimposed upon this, a whole host of morphological and histological findings that are unique only to photo aging.

Photo aged skin is found predominantly on the sun exposed surfaces of skin types 1–3 individuals who have had chronic, cumulative UV light exposure. The degree of damage depends upon many factors, including, hereditary factors, skin type, degree of exposure, geographical location, amount
of sun block used and the number of medical interventions, such as Trentenoic acid, Hydroquinones, Vitamin C serums, Dimethylamino ethanol, FotoFacials®, Peels or Laser resurfacing that many patients have performed.

Photo aged skin contains partially repairable cumulative damage to the skin’s cellular elements and ground substance. The exact pathophysiology and mechanism of action and damage is not completely understood, but is likely related to the cellular DNA effects of UV light and the abnormal, inaccurately copied DNA strand repair and flawed protein synthetic products that accumulate from the persistent and abnormal DNA molecules. Because no precise animal model exists, the precise spectral band of light responsible for the elastotic damage is not known, but UVB and, to a lesser degree UVA and even Infrared heat energy have been implicated.

TABLE 2

Clinical and Histological Features of Photo aged Skin

<table>
<thead>
<tr>
<th>Clinical Feature</th>
<th>Histological Finding</th>
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<tbody>
<tr>
<td>Dryness of the Epidermis</td>
<td>Large Keratinocytes</td>
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<tr>
<td>“Xerosis”</td>
<td>Slower transit time</td>
</tr>
<tr>
<td></td>
<td>Epidermal Hyperplasia</td>
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<tr>
<td></td>
<td>Thickened Epidermis</td>
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<tr>
<td>Actinic Keratosis</td>
<td>Nuclear Atypia</td>
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<tr>
<td></td>
<td>Loss of orderly Keratinocyte Maturation</td>
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<tr>
<td></td>
<td>Dermal Inflammation</td>
</tr>
<tr>
<td>Dyschromia</td>
<td>Irregular pigmentation at Various levels</td>
</tr>
<tr>
<td>a) Freckling (Eiphili)</td>
<td>Hypertrophic, strongly dopa-positive melanocytes</td>
</tr>
<tr>
<td>b) Lentigines</td>
<td>Increase number and melanization of melanocytes</td>
</tr>
<tr>
<td>c) Diffuse, Persistent Hyperpigmentation</td>
<td>Elongation of epidermal rete Ridges</td>
</tr>
<tr>
<td>d) Guttate Hypomelanosis</td>
<td>Increased number and diffuse of dopa-positive melanocytes</td>
</tr>
<tr>
<td>Wrinkles</td>
<td>Reduced number of abnormal dopa-negative melanocytes</td>
</tr>
<tr>
<td>a) Fine Surface Rhytides</td>
<td>No histological correlate</td>
</tr>
<tr>
<td>b) Deep Rhytides and Furrows</td>
<td>Contraction and shortening of fascial septae in the</td>
</tr>
<tr>
<td></td>
<td>subcutaneous fat</td>
</tr>
<tr>
<td>Stellate, photo aged pseudoscars</td>
<td>Absent epidermal</td>
</tr>
<tr>
<td></td>
<td>Pigmentation &amp; decreased</td>
</tr>
<tr>
<td></td>
<td>Dermal collagen</td>
</tr>
<tr>
<td>Solar Elastosis</td>
<td>Nodular accumulation of abnormal whorls and</td>
</tr>
<tr>
<td>(fine nodularity and coarseness)</td>
<td>bundles of fibrous and amorphous fibers in the</td>
</tr>
<tr>
<td></td>
<td>papillary dermis</td>
</tr>
<tr>
<td>Loss of Skin Elasticity</td>
<td>Elastotic dermis</td>
</tr>
<tr>
<td>Telangiectasia</td>
<td>Ectatic vessels with atrophic walls</td>
</tr>
<tr>
<td>Venous Lakes</td>
<td>Ectatic venous vessels with atrophic walls</td>
</tr>
<tr>
<td>Purpura</td>
<td>Delicate vascular walls</td>
</tr>
<tr>
<td></td>
<td>Extravasated RBCs</td>
</tr>
<tr>
<td>Sebaceous Hyperplasia</td>
<td>Small white papules;</td>
</tr>
<tr>
<td></td>
<td>Concentric hyperplasia of Sebaceous glands</td>
</tr>
<tr>
<td>Comedones</td>
<td>Ectatic superficial portion of the pilosebaceous follicle</td>
</tr>
</tbody>
</table>
The clinical picture of predominantly photo aged skin is thick, rough textured, leathery skin, often with numerous Actinic Keratoses. Multiple fine and deep rhytides dominate the facial landscape. There is often diffuse hyperpigmentation, freckles and lentigines co-existing together and forming dyschromic facial skin. Often there is a background of spider telangiectasia and erythema. There is a predominate loose inelastic quality to the skin, with diminished ground substance and poor hydration and xerosis. Like the aged, non-environmentally aged skin, there is a loss of the subcutaneous fat and loss of tone and ptosis of the facial musculature.

**The SpaMedica® Plus and the Photo aged Skin**

For those patients who have predominantly photo aged skin changes superimposed upon non-environmental skin aging, the SpaMedica® Plus is prescribed. The SpaMedica® Plus incorporates all of the therapies of the SpaMedica® lift, including the SonoPeel®, CaviFacial™, SonoFacial® and Resistive MyoFacial®. However, optimal dermal therapy necessitates the addition of the FotoFacial RF®. The FotoFacial RF® is an intense-pulsed light and Radiofrequency (hence RF) procedure that reverses and rejuvenates much of the morphological and histological aged pathologies of Photo Aged skin. I helped to develop the FotoFacial®, FotoFacial Plus® and FotoFacial RF® procedures with my dermatologic colleague and cutaneous research partner Dr. Patrick Bitter, Jr., of San Jose, California. Over the past few years, we have jointly, through our Advanced FotoFacial® Certification Course, trained 2,000 physicians worldwide in this technique.

If you practice in a geographic region, or have a practice spectrum, where there are very few photo aged patients, then the FotoFacial RF® procedure and the technology required may not be as commonly performed for sun damage as in sunbelt regions, however, there will be many SpaMedica® Plus patients because of the need to improve rosacea, erythema, telangiectasia, enlarged pores, skin laxity, uneven texture and fine–moderate lines and wrinkles. The SpaMedica® Plus procedure, with the additional FotoFacial® will be an essential part of total facial rejuvenation and your non-invasive SpaMedica® lift facelift practice. Remember, the first rule of good facelift or SpaMedica® lifting, is make beautiful skin before you reposition it. There is nothing worse than repositioned skin in youthful, vertical, Ogee congruent positions, that is old, wrinkled, discolored and porous. There is no better way to make beautiful skin than the FotoFacial RF®. For more information on the FotoFacial procedure, go to www.fotofacialRF.com.

2. Skin Types 4 & 5 with Hyperpigmentation

These darkly pigmented individuals often present with dyschromia of the superficial and deep dermis as well as epidermal, textural roughness and irregularity and ptosis of the soft-tissue envelope. The SpaMedica® will provide optimal and effective epidermal rejuvenation and an elevation of the ptotic soft-tissue elevation. The SonoPeel®, with its CaviFacial™, the SonoFacial® and MyoFacial® are very safe on darker Fitzpatrick skin types and will deliver smoother epidermal and dermal texture, as well as elevation of the brow, cheeks and neck. For optimal blending and even resolution of the dyschromias, specifically the diffuse or regional hyperpigmentation,
lentigines, nevi and dermatosis papillosis nigra that affect the darker skin types, the SpaMedica® Plus, with the addition of Foto Facial RF® skin rejuvenation is often advantageous and certainly synergistic to the SpaMedica® therapy alone. Generally, the skin type five patients will receive the basic SpaMedica® therapy and concomitant Obaji™ type skin care regime for 6 weeks before instituting the Foto Facial® therapy.

3. Rosacea, Diffuse Erythema and Flushing
The Rosacic skin types typically have very sensitive skin. Generally, the sensitive skin types will not be unable to tolerate crystal based microdermabrasion systems, nor chemical based peels. The SonoPeel® and Cavi Facial® epidermal therapies can be modified to be very gentle and are well tolerated by the sensitive skin types. The Sono Facial® therapies will help restore dermal vitality, while the Resistive Myo Facial® will elevate and tighten the soft-tissue envelope in these individuals. These “pink” patients benefit from the SpaMedica® Plus and addition of the Foto Facial RF®. The Foto Facial® is the one of the best therapies available to improve, blend and harmonize the diffuse telangiectasia, erythema and rosacea, as well as the vasomotor instability at the root of flushing and blushing, large pores and fine–moderate wrinkling.
Acknowledgment of Complete Comprehension

I __________________________, franchise trainee, on this date of __________ have carefully read and have a thorough understanding of every page of this chapter. I have initialed each page that signifies I have no further questions whatsoever regarding the information in this chapter, and that all my questions have been answered by the SpaMedica® franchisor trainer to my complete and total satisfaction.

Franchisee Signature ____________________________________________________________

Name ______________________________ Date _________________

Franchisor Trainer Signature ______________________________________________________

Name ______________________________ Date _________________