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PRF IN FACIAL ESTHETICS

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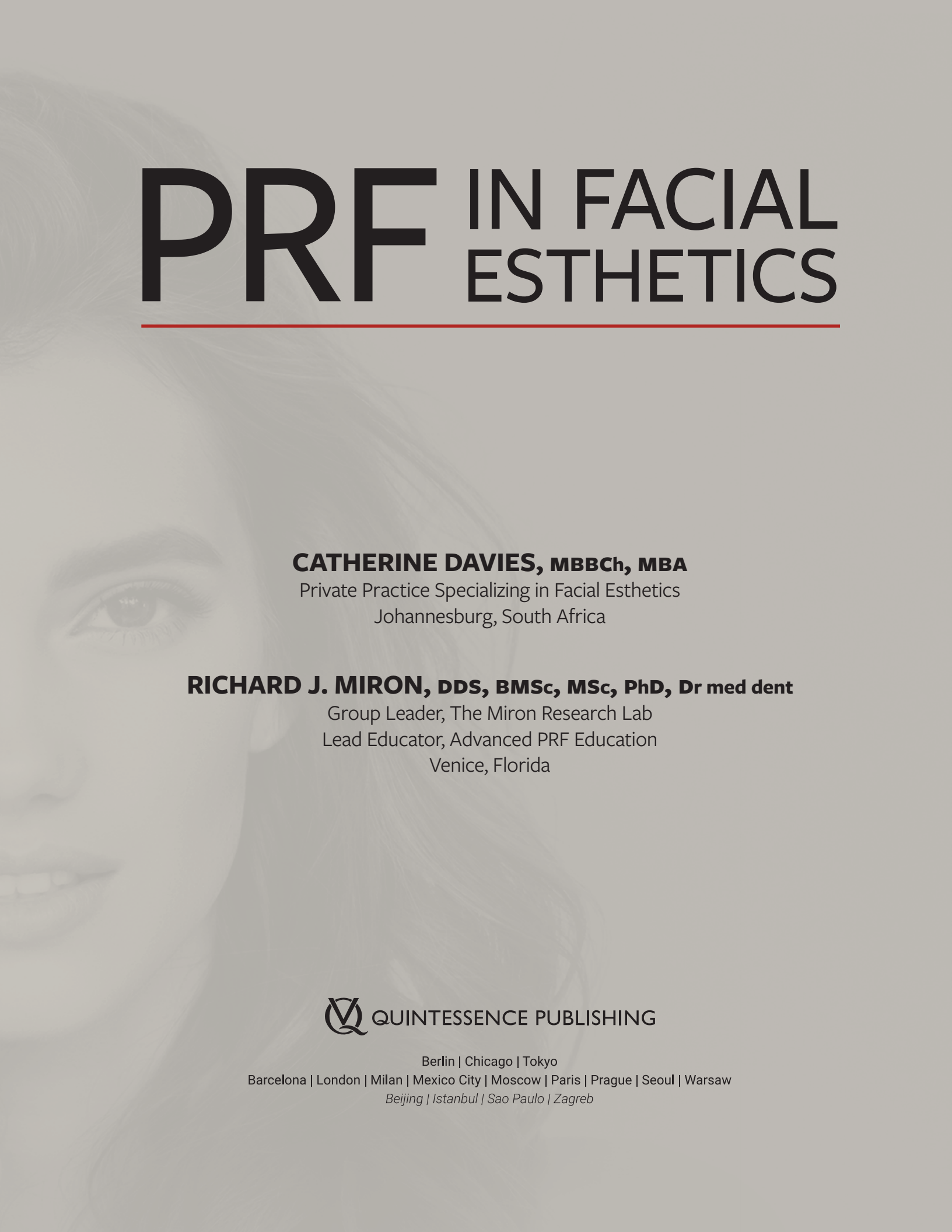

PRF IN FACIAL ESTHETICS

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To Dr David Koski

When I moved to the United States 3 years ago, somehow you convinced me to think BIG. You took time out of your schedule to mentor me, volunteered many of your hours freely to support our education programs, and have been supportive beyond my comprehension. You called me Lebron when I didn't understand. You taught me to "scale" when I knew only science. And you provided endless advice on topics I never considered relevant. I never expected to find such a wonderful role model and mentor, all calmly behind the scenes. You never asked for recognition. I have no words to express my gratitude and wanted to somehow show my appreciation. I therefore dedicate this book to you, Dr Koski. This one is for you, big guy! **—RJM**

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Preface /

Facial esthetics has become one of the fastest-growing industries in the world. The esthetic demand for patients worldwide has never been higher, leading to this multibillion-dollar, booming industry. As the field continues to evolve, it is important that all medical practitioners are able to provide solid, evidence-based procedures while minimizing complications. Platelet concentrates have long been utilized in regenerative medicine, and over the years, the removal of anticoagulants has further improved their safety and effectiveness. Today, platelet-rich fibrin (PRF) has nearly replaced platelet-rich plasma in many fields of medicine and has gradually made its way into the medical esthetic arena. Furthermore, its use has been combined with other leading therapies to expand treatment possibilities. As trends continue to support minimally invasive esthetic procedures, it is clear that both the beginner as well as the advanced practitioner seek convenient, safe, and effective therapies.

This textbook is a first of its kind and an introduction to PRF in facial esthetics. The book was a true joy to put together, as many international experts in various fields of medicine have tremendously improved the quality of the final chapters. It has been a privilege to collaborate with basic scientists, the developers and clinician-scientists of microneedling, leading experts in laser therapy and low-level laser therapy, experts in photography, as well as plastic surgeons and hair restorative surgeons. This book is truly unique in that it gathered numerous experts across many fields with the ultimate goal of collectively providing as much knowledge on this topic as possible. We are therefore thrilled to present the first edition of our textbook, *PRF in Facial Esthetics*, and we look forward to your future feedback.

Acknowledgments

We greatly acknowledge the tremendous contributions of our coauthors. Each of your specific expertise has been greatly valuable, and what a privilege to continue to work with each of you. The field will certainly continue to progress, and we sincerely enjoy our collaborations with each of you.

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To Advanced PRF Education at prfedu.com and all of its staff members, including Erin Anderson and Nichole Kramer from Dermapen, thank you for making teaching and education a top priority filled with exciting new challenges and ongoing learning experiences.

From Catherine Davies

I would like to express special thanks and gratitude to my amazing family—Paco, Zahra, Cuba, and Lila—for putting up with all the long working hours this year.

I would also like to thank Dr Richard Miron for his belief in me and for his invaluable guidance and advice during the writing of this book.

From Richard J. Miron

To my parents and family: Your unconditional love and support during this past year never goes unnoticed. Thank you for everything!

To Dr Catherine Davies: It has been a true joy and pleasure to work with you. Your bubbly personality and easy-to-understand teaching style is enlightening and seems to perfectly blend with my serious and rigorous scientific approach. I've enjoyed every moment of it—let's keep going!

To Leah Huffman: How we managed three books together in 1 year is not something I could ever have imagined. Thank you endlessly for being dedicated, passionate, punctual, and simply the most outstanding and prolific editor!

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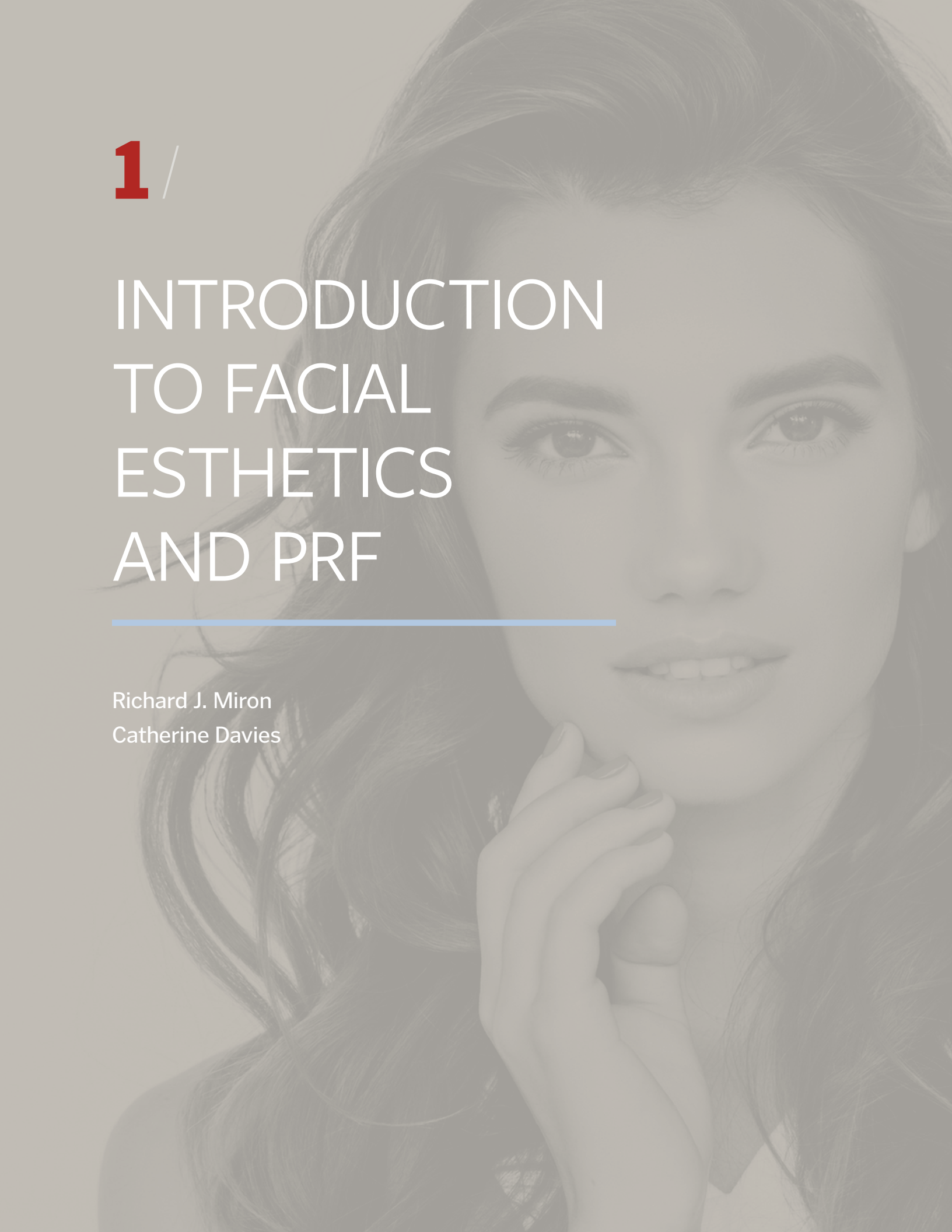

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INTRODUCTION TO FACIAL ESTHETICS AND PRF

Richard J. Miron
Catherine Davies

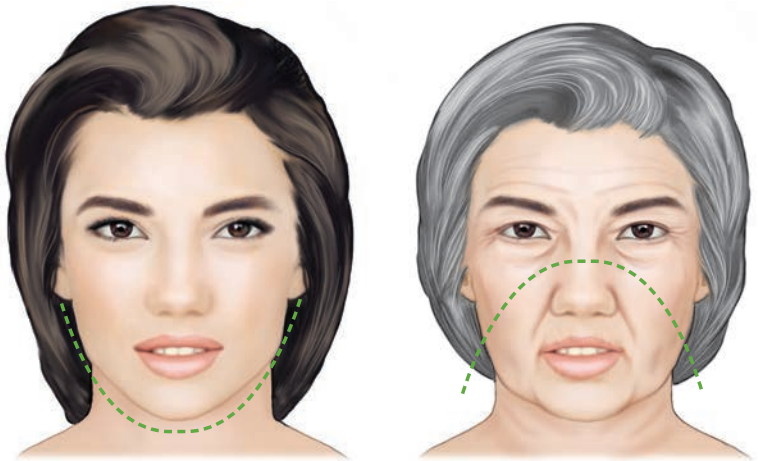
Facial esthetics has become one of the fastest-growing industries in the world. While originally a number of minimally invasive procedures were utilized effectively in facial esthetics (including Botox [Allergan], hyaluronic acids, and polydioxanone [PDO] threads), more recently platelet concentrates have gained momentum because of their more natural regenerative approach. The main advantage of platelet concentrates is that they offer a safe, easy-to-obtain, and completely immune-biocompatible method for the *healing* or *regeneration* of aging skin. This differs significantly from previous modalities that aim to act as *fillers* or *paralyzers*, which initiate a foreign body reaction once placed within living tissue. As the population continues to age and becomes more concerned with their esthetic appearances, more and more clinicians and practitioners wish to offer patients a natural approach with platelet concentrates and more specifically platelet-rich fibrin (PRF). As trends continue to support minimally invasive esthetic procedures, it is clear that both beginner as well as advanced practitioners seek convenient, safe, and effective therapies. Platelet-rich plasma (PRP) was the first platelet concentrate utilized in facial esthetics because of its supraphysiologic accumulation of platelets and their respective growth factors, known stimulators of tissue regeneration. However, one of its main limitations is its incorporation of anticoagulants, known inhibitors of wound healing. Today, with advancements in centrifugation protocols and centrifugation tube characteristics, it has become possible to utilize a liquid injectable PRF without incorporation of anticoagulants. This formulation has been studied and utilized extensively in various fields of medicine and has become increasingly popular in facial esthetics. This textbook provides a first-of-its-kind introduction to the use of PRF in facial esthetics.

Aging of the Skin

Aging of the skin is an inevitable process that gradually occurs as we get older[1,2] (Fig 1-1). Several factors have been associated with this process, including both genetic and environmental factors.[3] Exposure to sun, pollution, and various chemicals have been known to cause skin and/or DNA damage, speeding the aging process.[3] A number of changes to the skin may occur as a result, including skin atrophy, telangiectasia, fine and deep wrinkles, yellowing (solar elastosis), and dyspigmentation.[3] Furthermore, poor diet, lack of exercise, caffeine intake, smoking, and drug use are additional factors known to speed the aging process.[4]

One key element certainly important for overall health and particularly skin attractiveness is hydration. Dehydration of the skin may lead to epithelial cell apoptosis and flaky skin complexion. From this standpoint, skin dehydration is a major risk factor for skin aging, and many topical applications, including hyaluronic acid creams, are geared toward water retention as a modality to prevent dryness of the skin. Aging skin is also related to a number of obvious demarcations of the face (see chapter 2). Depressions in the corners of the mouth, cheeks, forehead, eyebrows, eyelids, and nose are all associated with aging[5] (Box 1-1; see Fig 1-1). Based on visible differences that occur with aging, a variety of treatment options have been proposed to favor a more youthful appearance, but hydration is a key feature.

As the body ages, it undergoes many changes that directly impact the physiology of human tissues, resulting in lower cellular activity.[6] These changes include a loss in density, increases in fat storage, and lower production of collagen. A reduction in collagen synthesis as well as its associated increase in collagen degradation both have apparent disadvantages leading to a net loss of facial volume, resulting in skin folds and wrinkles[7] (see chapter 2). Based on these changes associated with aging, several years ago it was proposed that platelet concentrates could be utilized in facial esthetics to improve collagen synthesis and restore facial volume.[8–10] The main function of platelet concentrates is to increase recruitment and proliferation of cells and to further speed revascularization/blood flow toward defective areas. Many advancements have been made since the first-generation platelet concentrate—platelet-rich plasma (PRP). Several devices and isolation kits have since been fabricated based on the concept of isolating platelets for regenerative purposes,



Youthful appearance
Optimal volume distribution

Aged appearance
Increased volume shift

FIG 1-1

The process of skin aging. With age, facial features tend to sag, with a volume shift downward of facial tissues.

BOX 1-1

Progressive changes expected in normal aging

- Corners of the mouth move inferiorly, resulting in a slight frown look
- Cheeks sag inferiorly, resulting in the appearance of jowls
- Tissue around the eyes sags inferiorly
- Eyelids (upper and lower) sag inferiorly
- Tissue of the forehead drifts inferiorly, creating wrinkles and dropping the eyebrows downward with flatter appearances
- Nose may elongate and the tip may regress inferiorly
- Nose may develop a small to pronounced dorsal hump
- Tip of the nose may enlarge and become bulbous
- Generalized wrinkling to the face naturally occurs

eliminating the inclusion of anticoagulants and speeding the preparation protocols. This second-generation platelet formulation, termed *platelet-rich fibrin* (PRF), has formed the basis for more than 600 scientific publications on the topic and has now extended into the field of facial esthetics. This textbook addresses this topic in detail and introduces the concept of PRF as a safer, more effective regenerative platelet concentrate that is 100% natural and thereby prevents a foreign body response.

Traditional Methods for Facial Rejuvenation

One of the first methods proposed for facial rejuvenation incorporated acupuncture.[11] This concept was derived based on accumulating evidence that trauma to the skin in the form of a needle and/or syringe, dermal roller, or more recently microneedling (see chapter 7) could induce slight tissue damage leading to new angiogenesis, growth factor release, and subsequent new tissue regeneration. This tissue regeneration resulted in a more youthful appearance.

Because of the popularity of such treatments in facial esthetics and rapidly increasing trends in the field, more invasive techniques have also been proposed. These include facelifts, aggressive laser treatment modalities, and various grafting procedures.[12–14] One of the advantages of platelet therapies is their ability to be used in combination with microneedling (see chapter 7), lasers (see chapter 10), plastic surgery (see chapter 12), and hair restoration (see chapter 9) simply to improve healing outcomes.

Traditional Biomaterials for Facial Rejuvenation

While various protocols and injectable materials have been proposed in facial esthetics, patients generally seek more natural regenerative approaches with the shortest possible downtime. In addition, medicine has gradually and naturally progressed toward more minimally invasive procedures. Today, many different agents and biomaterials can be utilized to accomplish this task, including Botox, fillers (eg, silicone, calcium hydroxyapatite, polymethyl methacrylate, hyaluronic acid products, hyaluronic acid + calcium hydroxyapatite, polylactic acid), various laser therapies at different wavelengths/intensities, and polydioxanone (PDO) threads.[15–21] These products and modalities have been

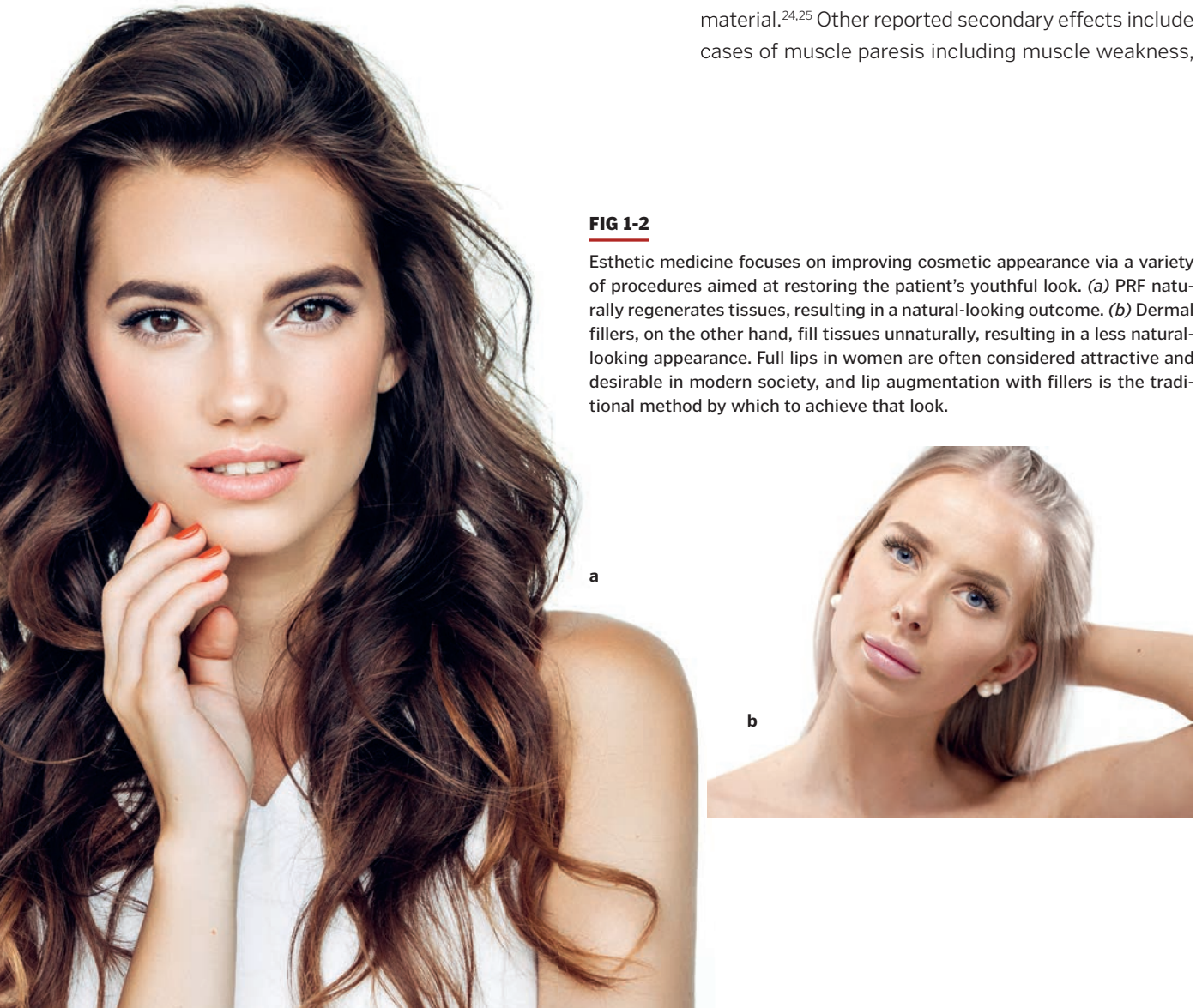
BOX 1-2

Unesthetic features that can be treated or eliminated with esthetic medicine procedures

- Scars
- Skin laxity
- Wrinkles
- Moles
- Liver spots
- Excess fat
- Cellulite
- Unwanted hair
- Skin discoloration
- Spider veins

made popular by extensive marketing and celebrity endorsements and have been demonstrated to be successful in various esthetic procedures to improve cosmetic appearance (Box 1-2).

Importantly, however, these techniques heavily rely on normal protective mechanisms of the epidermis, which can be altered or disrupted following their use. The use of Botox, for example, has shown secondary effects that may cause a cascade of reactions with potential consequences.[22] Botox causes temporary denervation and relaxation of muscles by preventing the release of the neurotransmitter acetylcholine at the peripheral nerve endings.[23] Clinicians generally recommend repeated injections every 6 months or so to maintain the facial appearance, but these injections may lead to secondary effects associated with an increased granular layer or thinning of the epidermis as a result of a foreign body reaction to this material.[24,25] Other reported secondary effects include cases of muscle paresis including muscle weakness,



a

b

FIG 1-2

Esthetic medicine focuses on improving cosmetic appearance via a variety of procedures aimed at restoring the patient's youthful look. *(a)* PRF naturally regenerates tissues, resulting in a natural-looking outcome. *(b)* Dermal fillers, on the other hand, fill tissues unnaturally, resulting in a less natural-looking appearance. Full lips in women are often considered attractive and desirable in modern society, and lip augmentation with fillers is the traditional method by which to achieve that look.

brow ptosis, upper and/or lower eyelid ptosis, lateral arching of the eyebrow, double or blurred vision, loss or difficulty in voluntary eyelid closure, upper lip ptosis, uneven smile, lateral lip ptosis, lower lip flattening, orbicularis oris weakness, difficulty in chewing, dysphagia, altered voice pitch, and neck weakness. And dermal fillers have been associated with over 40 cases of blindness!

Despite the potential for negative outcomes, Botox and dermal fillers are generally considered safe and effective (Box 1-3). Nonetheless, such cases of blindness and ptosis are sure to create some fear within the community. Therefore, other materials (especially those with limited complications) are constantly being investigated as potential alternatives that do not bear significant secondary side effects. The goal of therapy with PRF is not to replace these previously utilized materials but simply to offer an additional and safer modality to the field that regenerates tissues naturally (Fig 1-2a) as opposed to filling or paralyzing tissues unnaturally (Fig 1-2b). PRF therapy therefore offers a natural regenerative approach with natural-looking outcomes (see Fig 1-2a). While each of the previously utilized materials offers its respective advantages and limitations (like any material), it is important to note that each is also foreign to the body and creates an additional inflammatory response when entering the body. These products have certainly demonstrated low patient morbidity and complication rates, but less invasive therapies offer a decreased risk of potential complications and a reduction in patient fear. This is often heavily favored by new patients wishing to enter their first facial esthetic regimen.

BOX 1-3

Safety of Botox and dermal fillers

These materials have been utilized in millions of patients with relatively few serious adverse effects. While there have been some negative case reports, medical use of Botox and fillers is generally considered safe and effective. Proper training and use of high-quality products (ie, approved materials) are recommended.

BOX 1-4

Procedures in esthetic medicine

Surgical
- Liposuction
- Facelift
- Breast implants
- Radiofrequency abrasion

Nonsurgical
- Mesotherapy
- Radiofrequency skin tightening
- Nonsurgical liposuction
- Chemical peel
- Laser treatment

Esthetic Medicine

The field of esthetic medicine typically encompasses three specialties: *(1)* plastic surgery, *(2)* dermatology, and *(3)* reconstructive surgery. These specialties offer both surgical and nonsurgical esthetic procedures to improve cosmetic outcomes (Box 1-4), and these procedures can improve quality of life, psychologic well-being, and social function for many patients.

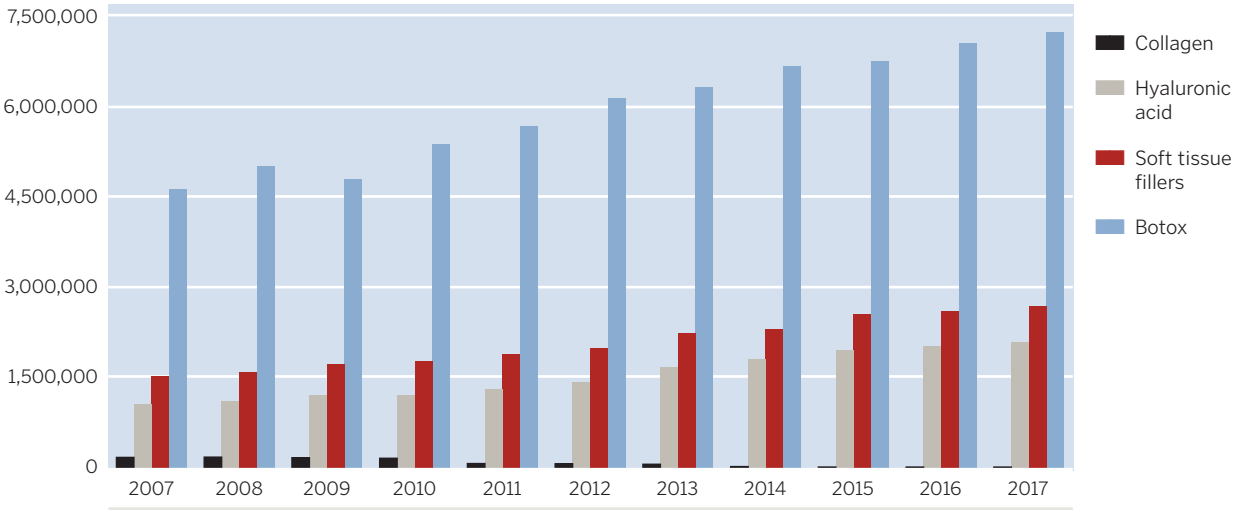


FIG 1-3

Number of minimally invasive procedures performed annually in the United States, a total of 16 million. (Adapted from the American Society of Plastic Surgeons.[26])

It is now estimated that roughly 16 million esthetic procedures are performed annually in the United States alone, as reported by the American Society of Plastic Surgeons[26] (Fig 1-3). Furthermore, reports have estimated that one billion people worldwide seek out solutions to help their facial and neck skin appear more youthful. This demand for facial esthetic procedures is only expected to further increase, as the skin care products market is valued at $177 billion annually.

Therefore, the ability to offer a more natural, autologous concentrate of growth factors derived from peripheral blood offers a very easy-to-obtain and low-cost method to regenerate facial tissues for patients. These less-invasive procedures have further become a norm in combination with microneedling, facial skin rejuvenation procedures, and hair restoration. Blood concentrates offer the ability to reach supraphysiologic doses of growth factors and cells responsible for the healing of various tissues using a natural healing approach.

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2 /

FACIAL ANATOMY, SKIN BIOLOGY, AND THE EFFECTS OF AGING

Catherine Davies
Richard J. Miron

Understanding facial anatomy is fundamental for any clinician interested in offering esthetic medical procedures. A thorough understanding of skeletal and soft tissue anatomy, facial features and landmarks, and the biology of the skin and hair is required to safely implement the various therapies described in later chapters of this book. The face is comprised of various layers, including the skin, connective tissue, subcutaneous fat, muscles, ligaments, and underlying bone. Within this network, an array of arteries, veins, and nerves also exist. Each layer must be reviewed independently in order to understand the goals and treatment strategies for augmentation of each specific layer and/or tissue type. Minimally invasive injections should avoid damage to key anatomical structures and aim to activate or accelerate wound healing. This chapter reviews the facial anatomy of the face and the biology of the skin and hair and presents an overview of the associated changes to these anatomical structures that occur over time with aging.

Facial Anatomy

Facial Characteristics and Age-Related Changes

The face in general plays a crucial role in society, particularly during social interactions. Facial features are highly relevant to revealing one's age, mood, and stress level. They are also relevant to facial attractiveness and facial expression, a pivotal language communicator. Younger-looking individuals have plump facial muscles and tight skin with the ability to fully express themselves during facial communication, whereas aging individuals have drooping muscles and loose skin with less facial expression.

Regardless of how beautiful one's appearance is in their youth, age-related changes and loss of facial volume and features are inevitable. These are often more pronounced and specific to certain areas. A gradual loss of soft tissue occurs in the upper midface region in conjunction with a downward migration of superficial buccal fat. Consequently, the upside-down triangle associated with a youthful look (see Fig 1-1) becomes inverted, with a larger proportion of soft tissue drooping below the midface. While the rate of aging varies among individuals based on genetics, environmental factors, sex, and ethnicity, the following traits are eventually common in all individuals (Fig 2-1):

FIG 2-1

Clinical characteristics of the aging face.

All figures in this chapter except Figs 2-11 and 2-12 are reprinted from Sattler and Gout's Illustrated Guide to Injectable Fillers *(Quintessence, 2016).*

- Drooping of the skin and soft tissues (with loss of subcutaneous fat)
- Wrinkles and creases around the eyes, lips, and forehead
- Changes in skin contour
- Changes in skin pigmentation (eg, dark circles)
- Eyebrow sagging (ptosis)
- Appearance of sunken eyes
- Loss of lip volume
- Irregular chin contour and sagging

Anatomy of the Face

This section of the chapter explores each layer of the face independently so that readers can gain a solid understanding of each before moving on to the next. Each of the images used to illustrate these layers serves as a reference that can be referred to when reading about injection techniques in later chapters. Figure 2-2 depicts common anatomical features of the face that should be standard language for the treating clinician.

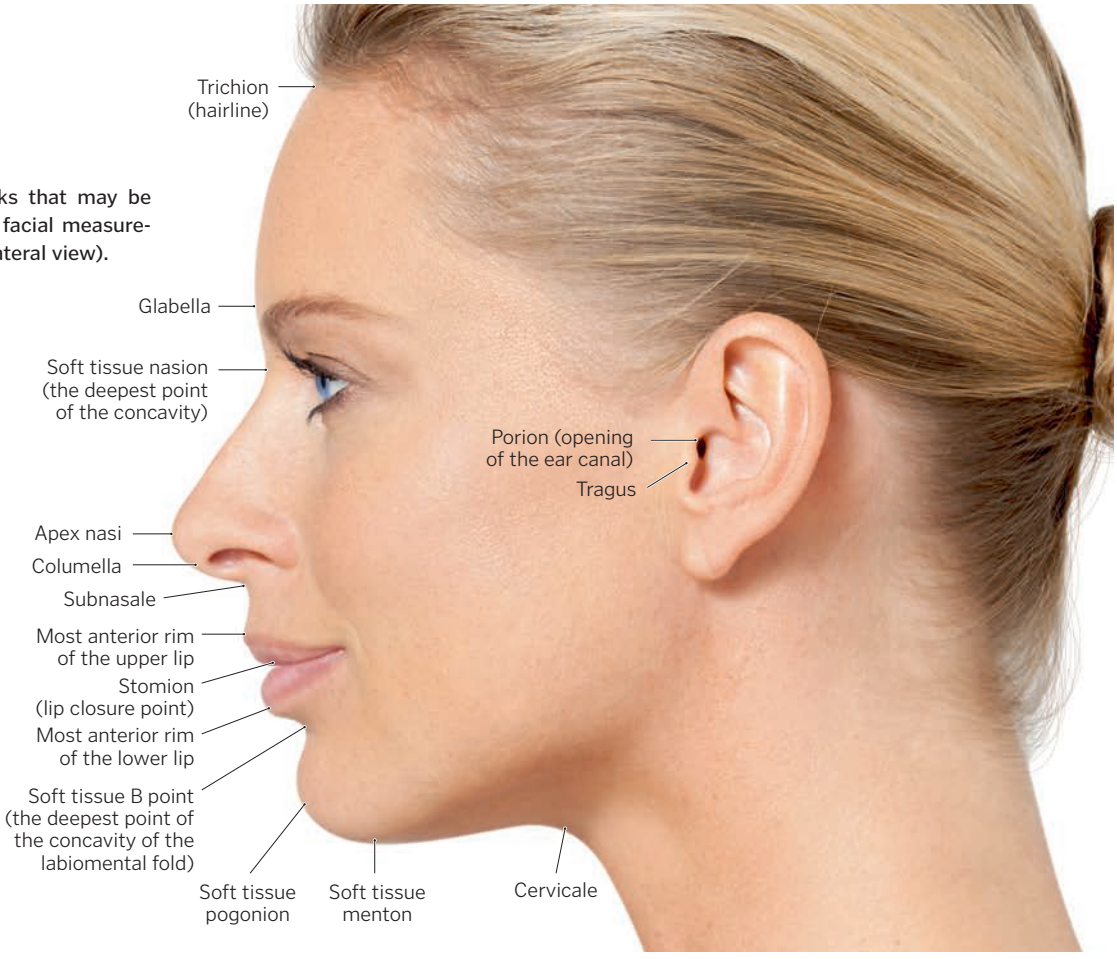

FIG 2-2

Landmarks that may be used for facial measurements (lateral view).

Facial skeleton

Figure 2-3 illustrates the various skull bones and their muscle attachment sites.

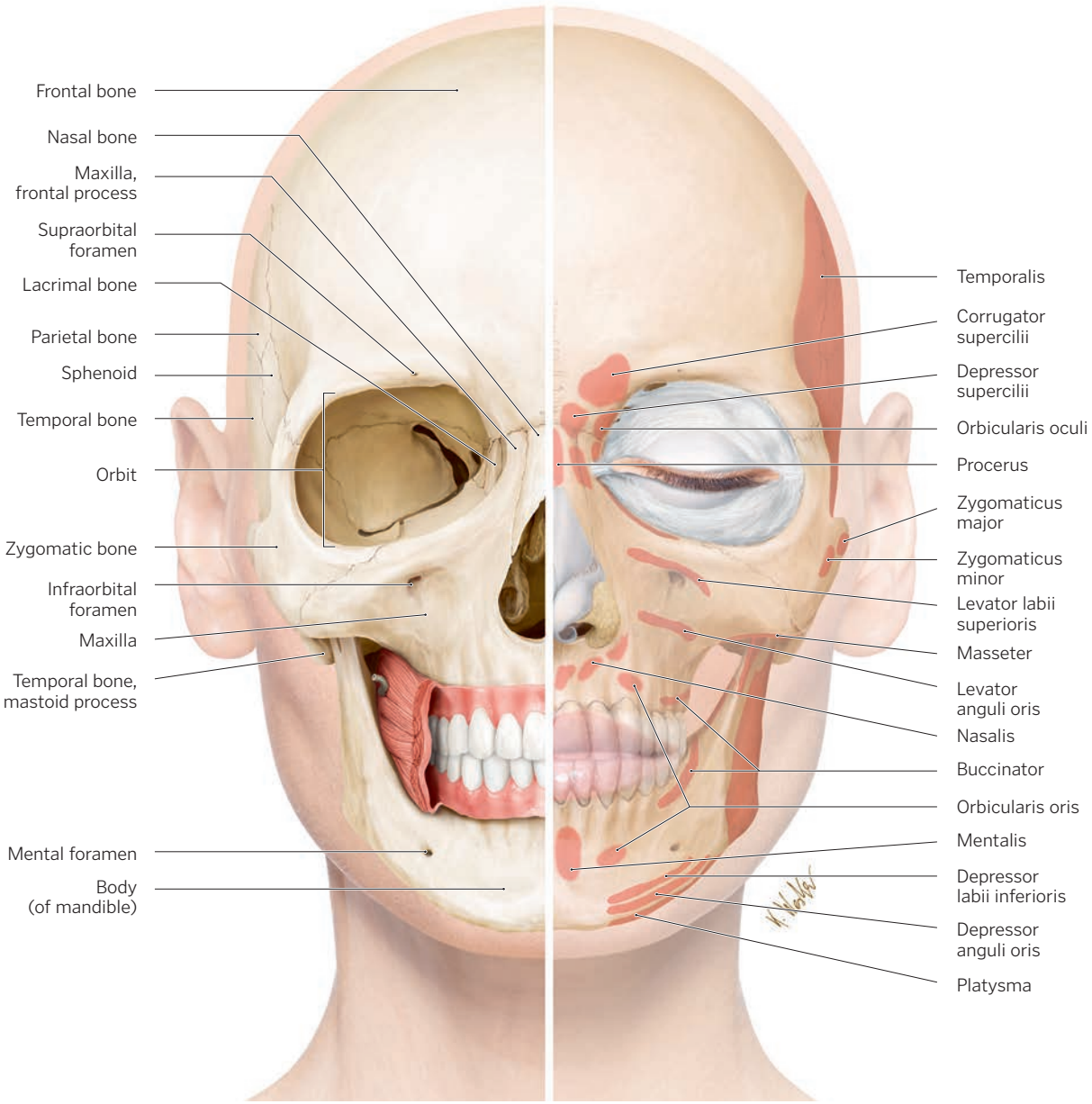

FIG 2-3

The facial skeleton *(left)* and muscle attachment sites projected onto it *(right)*.

Muscles of the face

The face consists of 30 different muscles. These are typically divided via three muscle planes and are thus distinguished as *(1)* superficial, *(2)* middle, and *(3)* deep (Fig 2-4). As dynamic coplayers in soft tissue complexes, muscles play an extremely important role in facial aging. Dynamic movements and facial expression require these muscles to contract, and naturally with age, these muscles become hypertrophic, permanently causing visible wrinkles that are involuntary and undesirable.

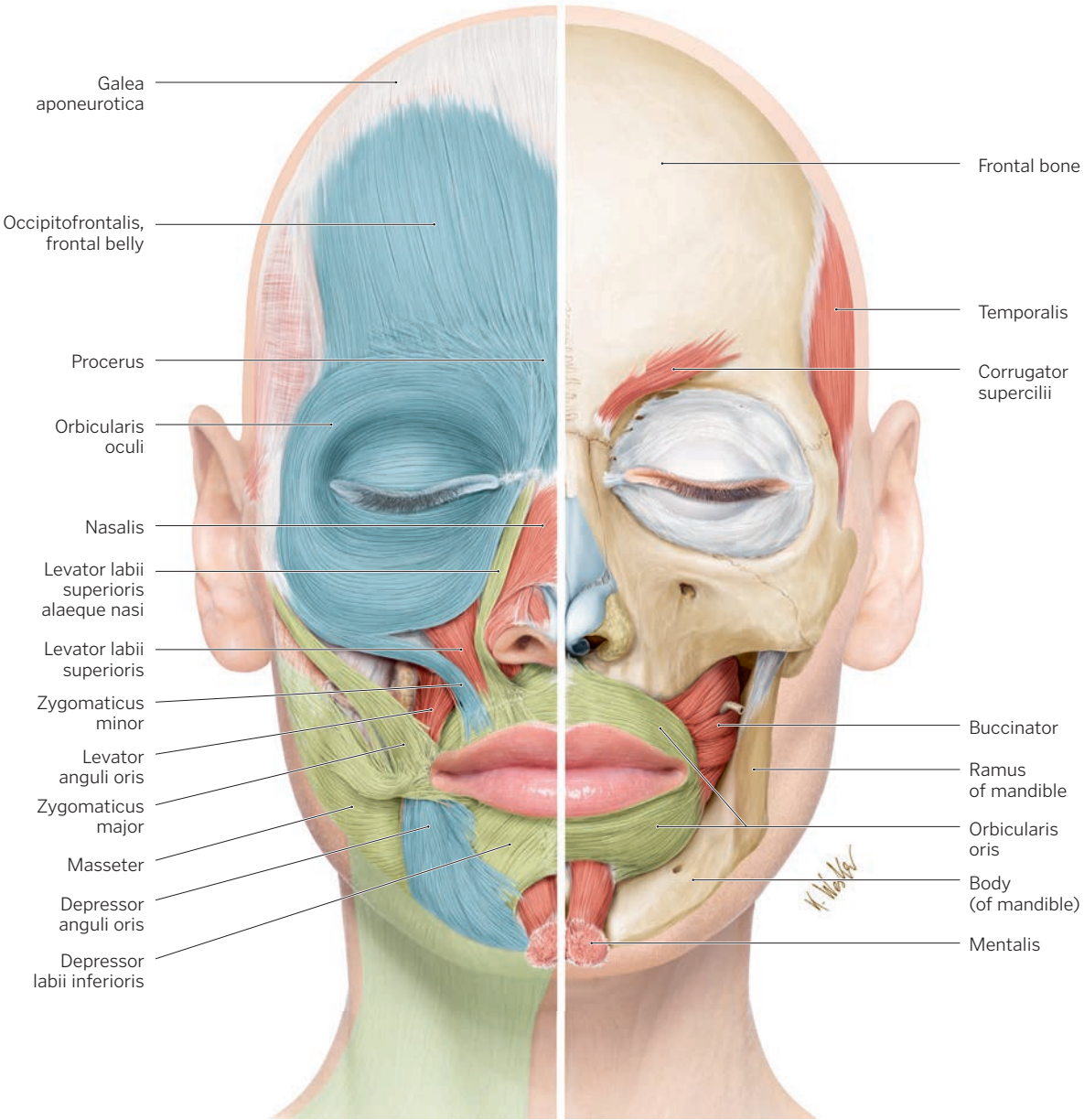

FIG 2-4

Schematic representation of the facial muscles in three planes: superficial *(green)*, middle *(blue)*, and deep *(red)*.

Subcutaneous fat and connective tissue

The subcutaneous fat in the connective tissue of the face acts as a volumizing cushion for the facial soft tissues. It plays a prominent role in protecting the face from external injury but also ensures a continuous supply of vital fluids and nutrients to facial tissues. The face has a continuous superficial fat compartment (Fig 2-5) and a discontinuous deep fat compartment (Fig 2-6). The superficial compartment is located superior to the superficial fascia of the superficial musculoaponeurotic system (SMAS), while the deep compartment is located beneath the SMAS. Both compartments resemble honeycombs in shape and provide an even, smooth distribution of the skin. Areas with high volume of superficial fat in the face are typically well defined and homogenous in layer. These include the cheeks, nasolabial folds, glabella, and the jaw-chin region (see Fig 2-5). In older patients, this specific tissue decreases with age, with a resulting atrophy typically caused by reduced blood flow. Because there is little superficial fat in the area of the temples and forehead, and almost none in the periorbital and perioral region, these areas are more prone to wrinkles and folds with aging and are one of the first visible signs of facial aging in individuals.

Figure 2-6 illustrates the deep fat layers. These include the SMAS, retro-orbicularis oculi fat (ROOF), glabellar fat pad, buccal fat pad, and inferior process of the Bichat's fat pad, among others. These fat pads are larger and, in youthful faces, fully prominent. With aging, atrophy and loss of volume occur, and this again is one of the main visible signs of aging.

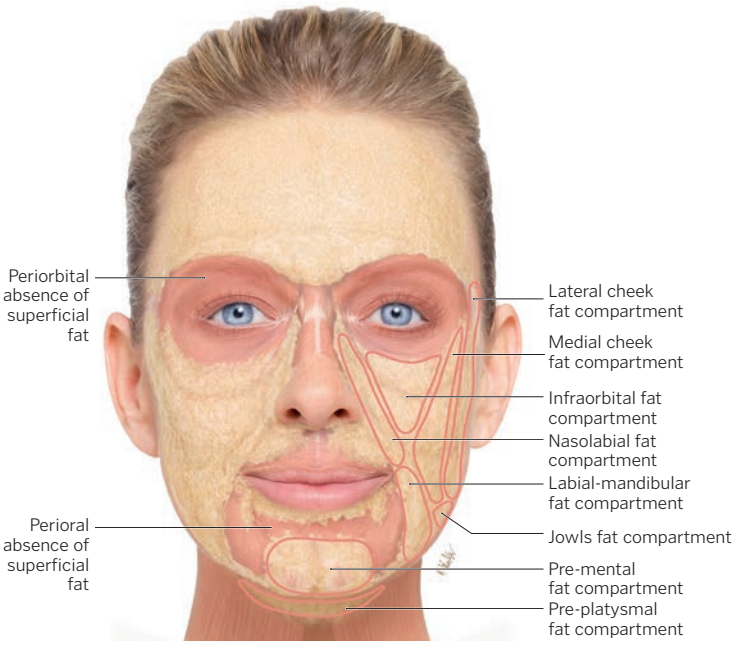

FIG 2-5

Superficial fat distribution in the face.

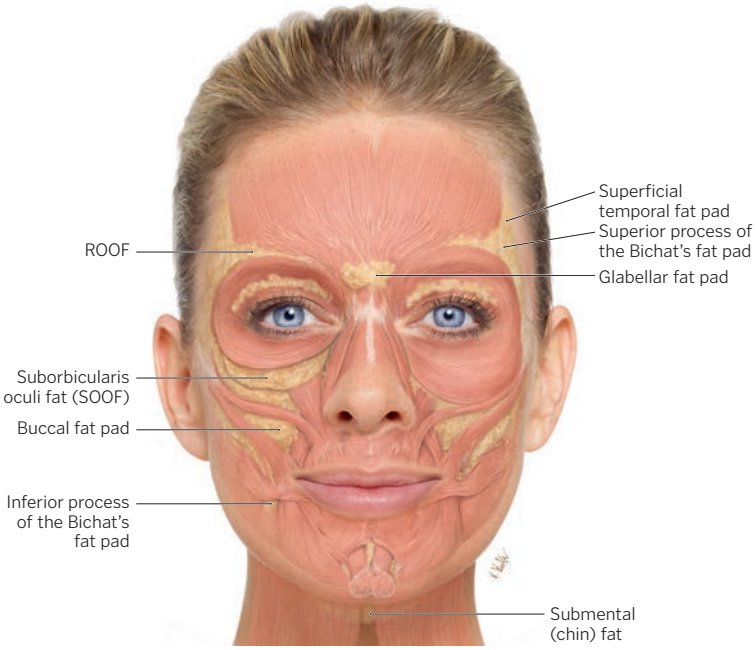

FIG 2-6

Deep fat compartments of the face.

Blood supply

A prominent and complex blood vascular network exists throughout the entire region of the face (Fig 2-7). The peripheral skin layers receive their blood supply from fine capillary vessels. These small vessels allow adequate diffusion into all facial layers. When injecting into areas of the face, **a thorough understanding of the location of the major blood vessels is crucial**. This will avoid potential complications related to intravascular injections, most commonly reported with fillers.

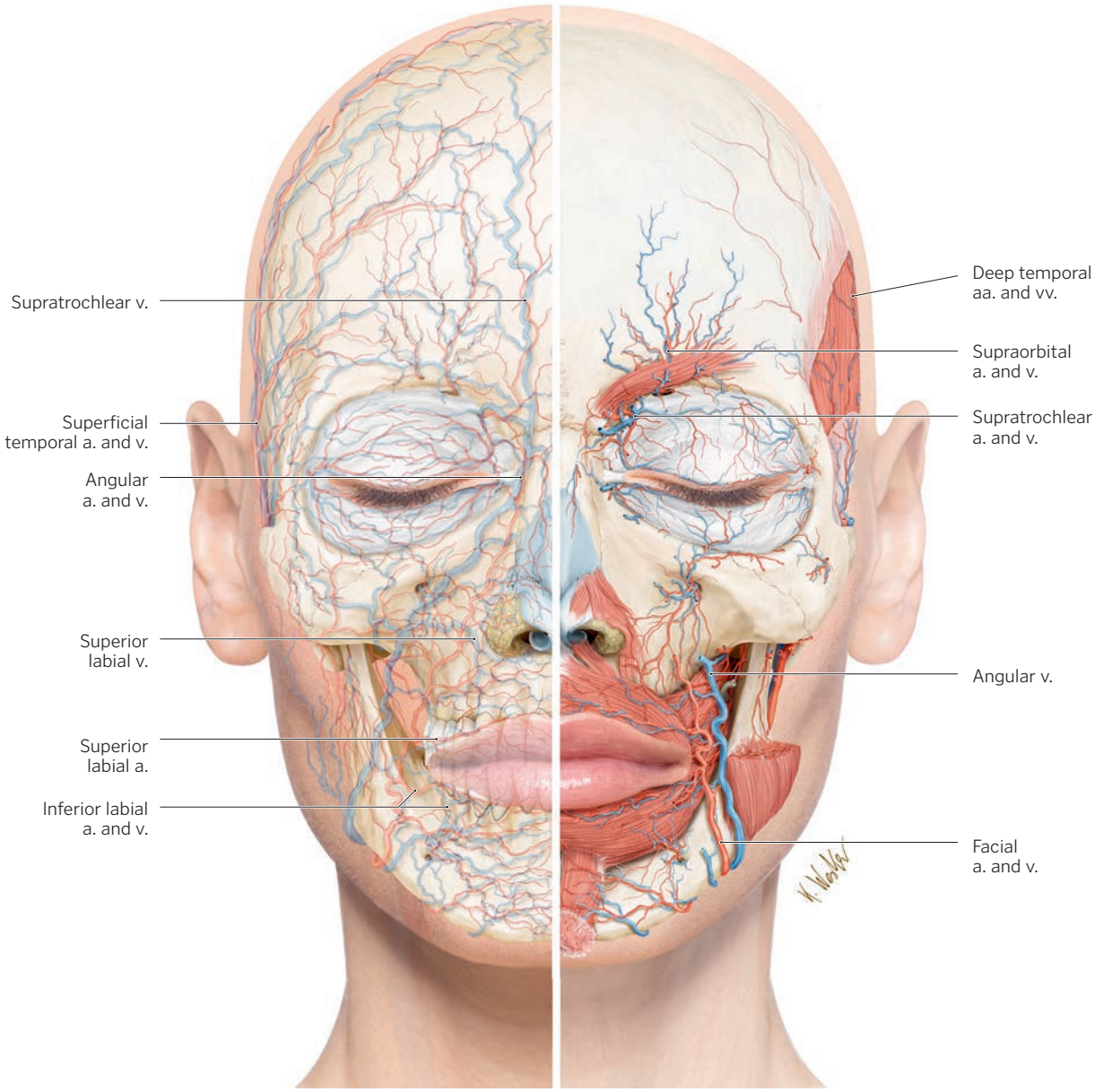

FIG 2-7

Blood vessels of the face projected onto the facial skeleton *(left)* and the position of the deep arteries and veins of the face relative to the deep muscles *(right)* (a., artery; aa., arteries; v., vein; vv., veins).

The anatomy of the facial arteries and veins in relation to the muscles of the face is also important to understand (Fig 2-8).

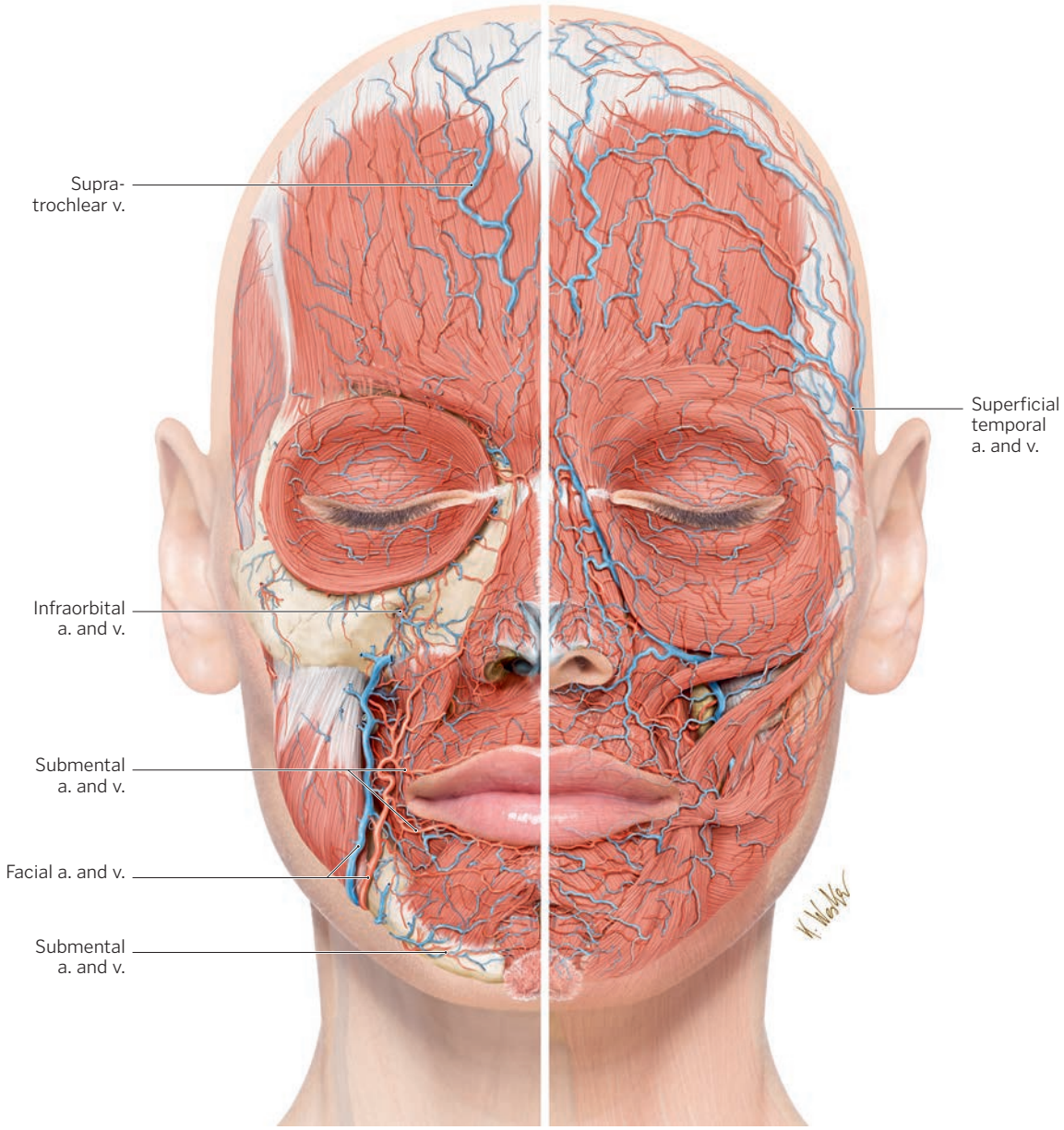

FIG 2-8

Position of the facial arteries and veins relative to that of the moderately deep *(left)* and superficial *(right)* muscles (a., artery; v., vein).

Innervation

Along with blood supply to the face, a complex innervation system exists within the face mainly from two sources: the trigeminal nerve and the facial nerve. The sensory innervation of the face is provided by the trigeminal nerve. This nerve is divided into three branches: The V1 ophthalmic nerve exits the orbit via the supraorbital foramen and fissure and supplies sensation to the upper part of the face. The V2 maxillary nerve exits from the infraorbital foramen and innervates the midface. And the V3 mandibular nerve innervates the mandibular and temporal regions (Fig 2-9).

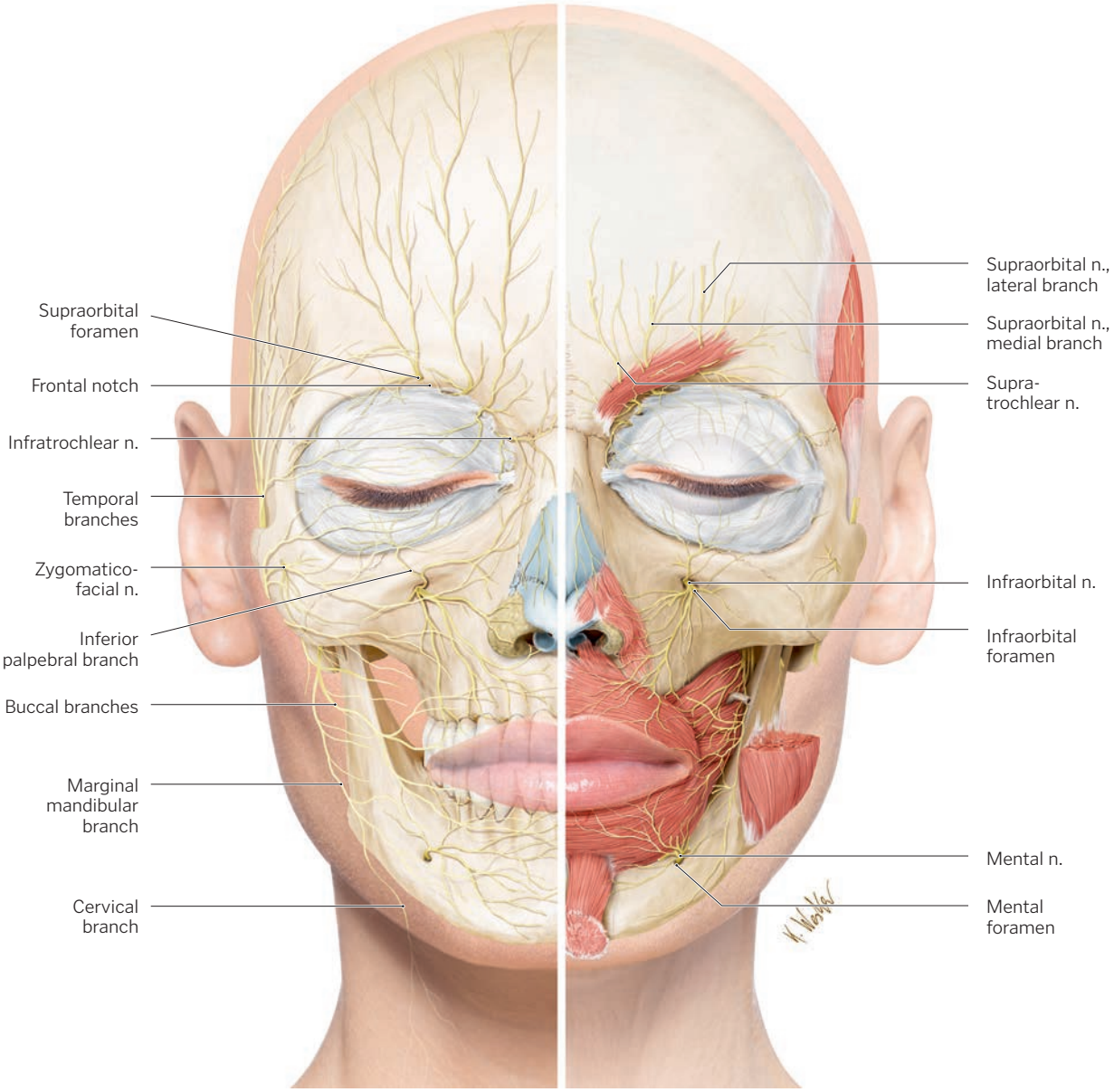

FIG 2-9

Overview of the nerves of the face projected onto the facial skeleton *(left)* and the position of the deep facial nerves relative to the deep muscles *(right)* (n., nerve).

The facial nerve, on the other hand, innervates muscles that are involved with facial expression. It divides into five major branches within the parotid gland, and most run superficial to a number of muscles (Fig 2-10). In brief, the temporal branch innervates the temporal, frontal, and palpebral muscles; the zygomatic branch innervates the zygomatic region and lower eyelid muscles; the buccal branch innervates the cheek and periorbital region muscles; the marginal mandibular branch innervates the chin muscles; and the cervical branch innervates the platysma muscles (see Fig 2-10).

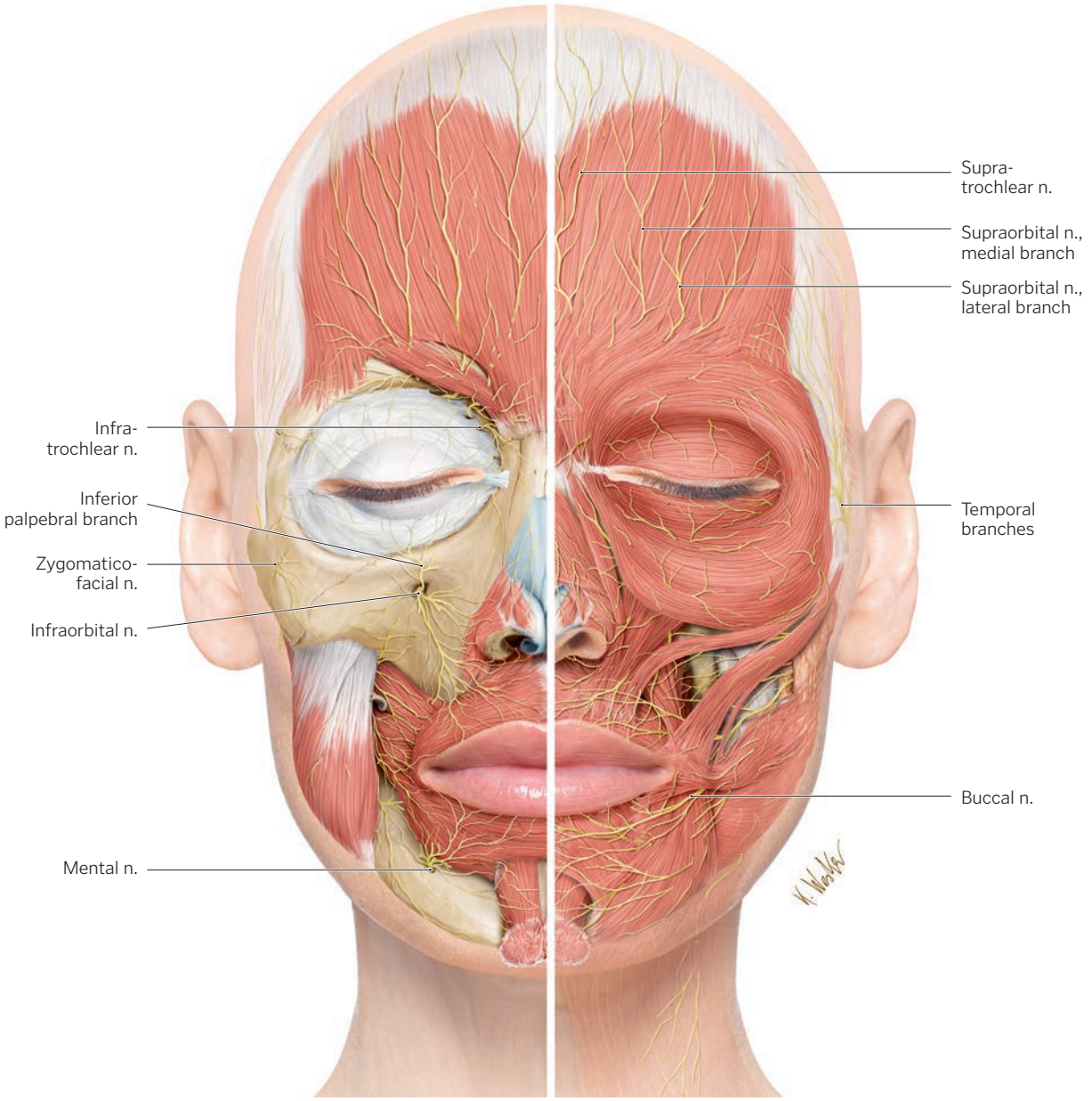

FIG 2-10

Position of the facial nerves relative to the moderately deep *(left)* and superficial *(right)* muscles (n., nerve).

Biology of the Skin and Hair

Structure and Function of the Skin

As the body's largest organ, the skin is vital for maintaining human health. While the skin performs many vital functions, its core function is to provide a protective barrier and waterproof sheath for the body. As such, it protects the body's organs against ultraviolet (UV) light, water loss, microbes, and chemicals. It further assists in temperature regulation and is actively involved in immunologic activities. In addition to executing these vital functions, the skin is also closely related to one's self-esteem, perception of age, and general well-being. The skin may have a profound impact on social interactions and has been described as playing a key role in esthetics.

The skin is composed of three layers:

1. *Epidermis:* The epidermis is the outermost layer of the skin and is made up mainly of keratinocytes. The vital barrier function of the skin resides primarily in the top stratum of the epidermis, the stratum corneum. This layer provides a barrier to loss of water from the skin, thus protecting against dehydration, and provides a barrier to irritants of the skin. Melanocytes are the pigment-producing cells of the epidermis and are found at the basal layer. Langerhans cells are scattered in the suprabasal region of the epidermis and provide an important immune barrier.
2. *Dermis:* The dermis is located beneath the epidermis and is between 1.5 and 4 mm thick. It is the thickest of the three skin layers and makes up approximately 90% of the thickness of the skin. The main functions of the dermis are to supply the epidermis with nutrients, to regulate temperature, and to store much of the body's water supply. The upper papillary layer has a thin, extensive vascular system that controls the amount of blood flow through the skin. The lower reticular layer is thicker and made of collagen fibers that strengthen the skin, providing structure and elasticity. This layer supports other components of the skin, such as hair follicles, sweat glands, and sebaceous glands.
3. *Subcutaneous tissue:* Also known as the *hypodermis*, the subcutaneous tissue is the deepest skin layer and varies in thickness from a few millimeters to several centimeters. It is made of fat, divided by loose connective tissue into fat clusters, and is separated from the underlying tissues by fascia.

Skin Aging

Human skin naturally ages over the course of one's lifetime as a result of evolutionary imperfection. However, skin is also directly exposed to environmental influences including smoke, UV light, and chemicals, which over the course of a lifetime may drastically speed the aging process. As skin ages, a number of phenotypic and common features may be observed, linked to dryness of skin, wrinkles, and loss of elasticity and/or pigmentation. With advancements made in microscopic imaging, it has become easier than ever to better understand the damage of the skin (caused by UV radiation, chemicals, etc) as seen in changes in collagen and elastic fibers. It is also known that aging causes a reduction in sebaceous and sweat glands typically described as senile xerosis with itching. Hair therefore becomes white and thin, spurring hair loss. Furthermore, aging also causes loosening of the subcutaneous fat layer, which results in a reduction of its thickness and strength and thereby causing a more droopy look. Especially in individuals with lighter skin, the appearance of extrinsic aging tends to be more pronounced and related to atrophy, whereas in darker skin types, a predominant thickening is more commonly observed.

Structural differences in skin also exist between the sexes and among different ethnic groups. In general, under similar climate conditions, the skin of Asian people develops wrinkles on average a decade later when compared to people of central European ancestry. Whereas Europeans typically show a gradual linear change in skin wrinkles and lines, Asians rapidly and dramatically begin to show signs of aging typically

between 40 and 50 years of age. However, in everyone, the number of melanocytes typically decreases by 8% to 20% per decade.

While many extrinsic factors play a role in skin aging—including UV exposure, smoking, ionizing radiation, excessive alcohol intake, malnutrition, poor diet, and emotional stress—up to 80% of overall skin damage is caused by direct UV light exposure. This is especially pronounced in lighter skin types. UV light increases the enzymatic activity of matrix metalloproteinases (MMPs), proteins known to be responsible for the degradation of collagen. Furthermore, UV light increases the amount of reactive oxygen species (ROS) in cells, which leads to DNA damage and increased chance for neoplasms. During such prolonged activity, the body accumulates ROS and the detox system is often overloaded. Antioxidants, such as vitamin C, have since been applied topically and have been shown to play a role in minimizing skin aging.

Intrinsic (genetic) factors also play a key role in aging. Typically, thinning of the skin occurs between the 3rd and 8th decades of life, generally accompanied by marked hypocellularity. This leads to a 10% to 50% reduction in skin thickness. Clinically this presents as loosening of the skin and a reduction in subcutaneous fat layers. A dramatic reduction in vascularity of skin tissues is also observed with aging and may be a primary link to the histologic observation of hypocellularity and reduction in skin thickness. The concept of utilizing a concentration of growth factors derived from blood (platelet concentrates) has therefore been proposed as a means to reverse or slow down the aging process, as discussed later in this textbook.

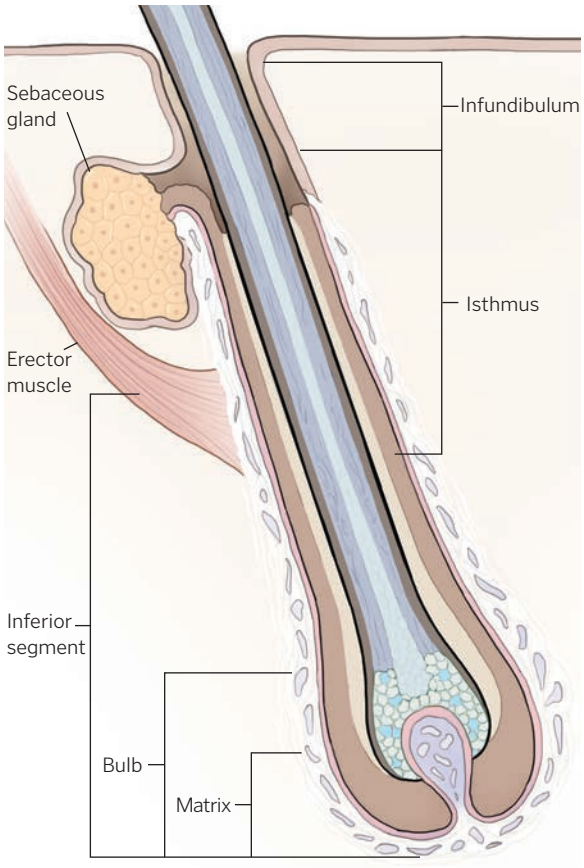

FIG 2-11

Representative image of a hair follicle. Injection techniques with platelet concentrates aim for the bulb of the hair follicle, located between 1.5 and 4 mm below the surface of the scalp.

Structure and Function of the Hair

The average human scalp contains between 90,000 and 140,000 terminal hairs. These hairs can grow approximately 1 cm per month. Meanwhile, hair loss is continuous, with people losing about 100 hairs per day on average.

The pilosebaceous or hair follicle unit is made up of the hair follicle along with an attached sebaceous gland and arrector pili muscle. Hair follicles vary considerably in size and shape, depending on their location, but they all have the same basic structure. The number and distribution of hair follicles over the body and the future phenotype of each hair is established during fetal development; no additional follicles are added after birth.

The hair follicle begins at the surface of the epidermis and extends into the dermis. Vellus hairs may extend only into the reticular dermis, whereas terminal hairs extend deeper, sometimes even into the subcutis (Fig 2-11).

Hair zones

Each follicle can be divided into distinct regions: the bulb, suprabulbar zone, isthmus, and infundibulum. The infundibulum begins at the surface of the epidermis and extends to the opening of the sebaceous duct. The isthmus is the area between the sebaceous duct opening and the bulge. The bulge is an area of the follicle marked by the insertion of the arrector pili muscle. The bulge contains several epidermal stem cells that are part of the outer root sheath and may be a target for hair loss treatments.

The bulge contains several epidermal stem cells that are part of the outer root sheath and may be a target for hair loss treatments.

The suprabulbar zone extends from the bulge to the top of the bulb. The hair bulb sits between 1.5 and 4 mm deep. The bulb contains matrix cells that proliferate regularly. These cells surround the sides and top of the dermal papilla and are responsible for the production of the hair shaft as well as the inner and outer root sheaths. The dermal papilla contains capillaries and interacts with the matrix cells in the hair bulb.

Melanocytes among the matrix cells provide the hair with its individual color. Hair color is determined by the distribution of melanosomes in the hair shaft. The hair bulb contains melanocytes that synthesize melanosomes and transfer them to the keratinocytes of the bulb matrix. Aging causes a loss of melanocytes and a corresponding decrease in the production of melanosomes, resulting in graying hair.

Hair layers

The hair shaft consists of an inner core known as the *medulla*. This is surrounded by the cortex, which makes up the bulk of the hair. Moving outward, there is a single layer of cells making up the shaft cuticle. The shaft cuticle is then encased in three layers that form the inner (internal) root sheath. The inner sheath is important in shaping the hair shaft as it grows upward from the matrix. The inner sheath keratinizes from the outside in and will eventually disintegrate midfollicle around the level of the isthmus. Finally, the outer (external) root sheath encases the entirety of the hair shaft. This layer undergoes trichilemmal keratinization around the level of the isthmus.

Sebaceous glands are acinar holocrine-secreting appendages of the epidermis and are a crucial component of the pilosebaceous unit. They are found all over the body, especially in certain areas of the skin such as the face. These glands open onto the hair follicles, except in areas such as the lips, where they empty directly onto the mucosa surface because lips do not contain hair follicles. When stimulated by hormones such as androgens, sebaceous glands produce and release sebum, an oily and waxy material. This contributes to the hydrophobic barrier of the skin.

The arrector pili muscle is a small band of smooth muscle bundle that attaches to the external root sheath of the bulge region of the follicle and extends to its superior attachment in the upper dermis. It is innervated by the sympathetic branch of the autonomic nervous system. In cold climates, sympathetic stimulation causes these muscles to contract. This raises the level of the skin slightly and causes the hair to stand erect, which is commonly referred to as "goosebumps."

The hair growth cycle

Hair growth occurs in a cyclical manner, but each follicle follows its own hair cycling schedule, completely independent of other hairs on the scalp. A normal hair growth cycle has three phases: anagen, catagen, and telogen (Fig 2-12).

The anagen phase is the active growth stage and typically lasts approximately 2 to 7 years on the scalp. Approximately 85% to 90% of hair is in the anagen phase at any given time.

The catagen phase, also known as the *transition phase*, lasts about 2 weeks and is a period of involution resulting in club hair formation after many cells in the outer root sheath undergo apoptosis. The club hair has a white, hard node on the end.

The telogen phase is also known as the *resting phase*. Club hairs, which are essentially dead, are held on the scalp. They are typically held for about 100 days

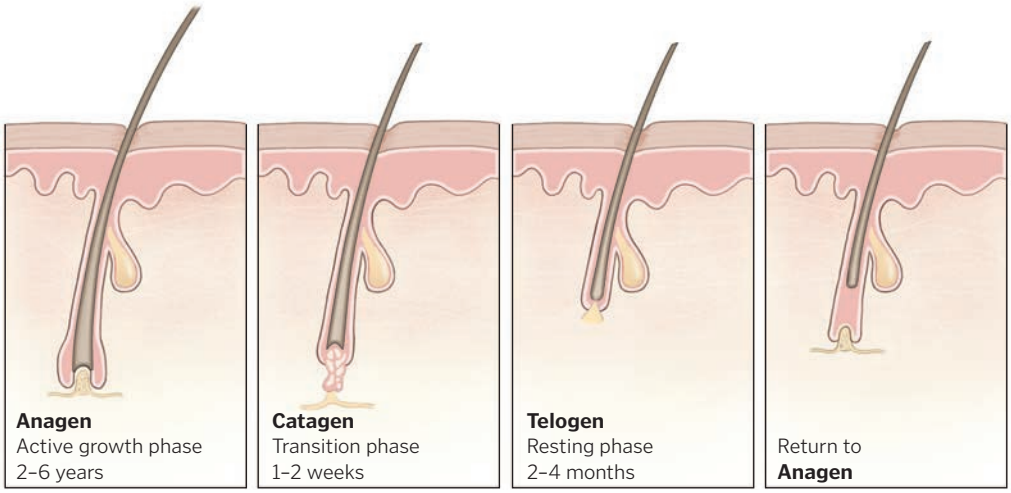

FIG 2-12
Hair growth cycle.

and then released and shed so that the anagen phase can begin again with a new hair.

Other sites on the body tend to have shorter anagen and longer telogen phases, causing most body hair to be shorter and remain in place for longer periods of time.

Hair loss and the growth cycle

When hair loss occurs, regardless of the cause, the hair growth cycle is almost always affected. An abnormal or disrupted hair growth cycle can occur at any phase:

- *Shortened anagen phase:* The duration of the growth phase is shortened, and the entire hair growth cycle becomes affected.
- *Early catagen phase:* When the growth phase is shortened, the hair follicle enters the transition phase earlier than normal.
- *Prolonged telogen:* As more hairs enter the resting phase prematurely, the normal resting phase becomes prolonged, causing increased shedding. A prolonged resting phase means that fewer hair follicles reenter the growth phase, which results in weaker or no regrowth.

Several factors affect hair growth:

- Genetics
- Androgens (testosterone and its active metabolite, dihydrotestosterone [DHT])
- Estrogens
- Thyroid hormones
- Glucocorticoids
- Retinoids
- Prolactin and growth hormone
- Drugs
- Nutritional status
- Stress

Androgens are the hormones with the greatest impact on the hair follicle. Testosterone and DHT act through androgen receptors in the dermal papilla. These hormones are responsible for androgenic alopecia later in life for genetically susceptible individuals as they cause miniaturization of follicles in the scalp. In adolescence, however, they increase the size of hair follicles in androgen-dependent areas such as the beard area.

The goal of any treatment approach, no matter the cause, type, or hair growth issue, is to normalize and restore the hair growth cycle.

Treating Facial Aging

As previously explained, there are a number of factors related to facial aging. While initially these changes occur on the anatomical and cellular levels below the skin surface, eventually they become apparent on the skin. Many of the early signs of aging are found in sites with little to no superficial fat layers.

When developing strategies for facial rejuvenation procedures, it is important to understand the anatomy and also the mechanism of tissue breakdown. The treating clinician may begin to wonder the following: Was the skin damage caused by UV exposure with resulting loss of collagen synthesis? Was it caused by smoking affecting blood flow? Are the wrinkles and facial folds caused by hyperactive muscles? These are all important questions to ask as a practitioner in order to develop and recommend effective therapeutic strategies.

Age-related changes in facial tissues most often alter blood supply, and as a result, atrophy-related deterioration is observed. This markedly decreases the thickness of fat tissue layers, the rate of cell division of skin cells, and collagen synthesis. Each of the above-mentioned scenarios also impairs the regeneration capacity of various tissue types as well as the natural barrier function of the skin. Skin hydration is also affected, leading to further signs of facial aging.

Many of the signs of aging are found in "hot spot" areas of the face. Figure 2-13 demonstrates the topographical comparison of sites with subcutaneous fat distribution versus those without. Notice that the regions with low fat content (around the eyes and around the lips) are more frequently clinically related to visible signs of aging. Therefore, the periorbital and perioral regions are starting points during facial rejuvenation strategies.

Remember: The visible signs that are observed externally in the skin (wrinkles, skin laxity, and folds) are almost always related to an underlying cause at a deeper tissue level not clinically visible.

Furthermore, deep fat atrophy is a significant age-related factor for skin aging and is primarily caused by a decrease in age-related blood flow, which decreases the supply of oxygen and nutrients to facial tissues and therefore causes shrinkage of deep fat stores. This gradual loss of fat volume from underlying subcutaneous tissues results in a decrease in skin tone and fluid levels in the facial tissue complex. Hence, vascular degeneration is considered a major cause of the initiation of facial aging and hence why platelet therapies such as PRF have been deemed extremely effective strategies for minimizing further facial aging and potentially reversing existing changes. Furthermore, this loss of deep fat stores is one of the main reasons why fat grafting has been commonly utilized as a strategy in facial esthetics, as discussed later in this textbook.

A loss of muscle and ligament attachment is also observed with facial aging, affecting esthetics. Consequently, when muscle activity decreases, skin laxity ensues. A gradual shift is observed over time, leading to increases in wrinkles and lines that can be involuntarily produced in areas of facial expression, especially when the face is relaxed.

Lastly, aging will affect bone. When bone mass is decreased and the facial skeleton shrinks, further skin laxity is observed. This is most pronounced in the cheek area, where early signs of bone loss lead to drastic and noticeable facial aging.

Each of these associated age-related aspects must be considered when designing ideal therapeutic strategies.

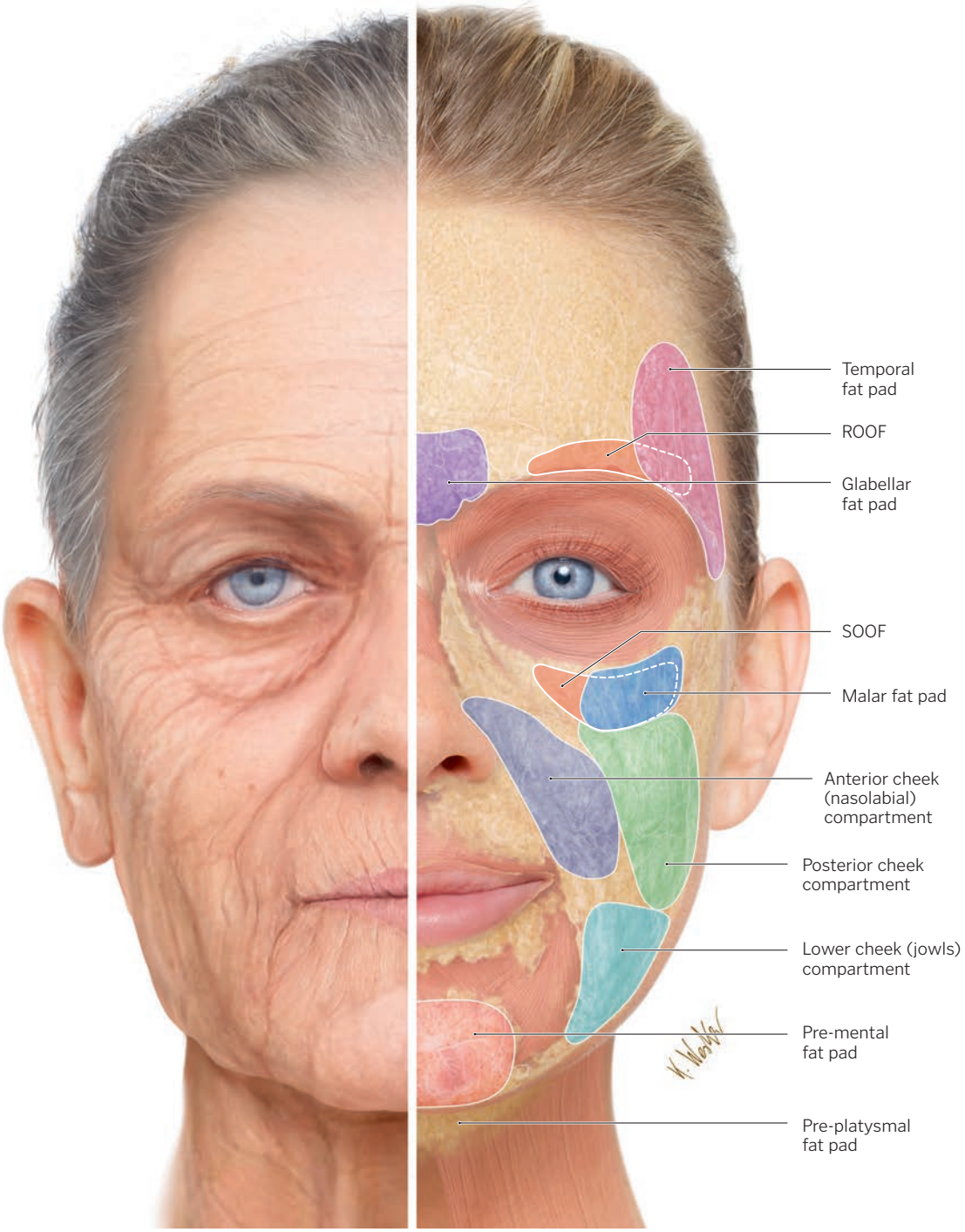

FIG 2-13

Split view of the clinical signs of aging and subcutaneous fat distribution of the face. It is apparent at first glance that there is a correlation between them. At sites where superficial fat is absent, alongside facial atrophy due to deep fat loss, the clinical signs of aging become apparent at a particularly early age. Sites of fat loss around the eyes and mouth are therefore considered to be facial aging "hot spots."

Summary

Today it is clear that the causes of facial aging are multifactorial and affect multiple tissue types. Because many facial changes occur anatomically below the skin surface, including a decrease in blood flow and subsequent fat loss, a solid understanding of the multidimensional processes involved in the skin, subcutaneous fat, connective tissues, muscles, and bone is required for any clinician wishing to perform facial rejuvenation procedures.

Superficial defects such as minor wrinkles can be treated with a variety of different modalities, such as PRF in combination with microneedling. Platelet concentrates like PRF are known inducers of angiogenesis and have since become pertinent to the field of facial rejuvenation, with the ability to further improve blood flow in deficient tissues. The following chapters provide strategies to improve angiogenesis via improved centrifugation techniques to formulate effective platelet concentrates such as PRF (see chapter 6), which may then be entered into facial tissues either by microneedling (see chapter 7), injection (see chapters 8 and 9), in combination with lasers (see chapter 10), or utilizing novel approaches (see chapter 12). While the field continues to evolve rapidly, these chapters provide an up-to-date overview of the use of PRF in facial esthetics.

3 /

PHOTOGRAPHY IN FACIAL ESTHETICS

Walter Rozen
Richard J. Miron
Catherine Davies

Photography is an essential component of medical esthetics to evaluate and track changes over time following therapy and/or aging. This becomes even more critical in the field of facial esthetics, where patient demand and expectations are continuously rising and patients seek the "youthful look." Treatment with platelet-rich fibrin (PRF) is known to stimulate new tissue regeneration by supplying soft tissues with a slow and gradual release of growth factors, resulting in a naturally rejuvenated look. This is opposite to other facial esthetic modalities, such as fillers or Botox, where a more instantaneous change in facial features is encountered following treatment, providing the patient with more immediate gratification. Photography therefore becomes essential during PRF therapy to evaluate progress over time. This chapter highlights the importance of photography in facial esthetics and provides an overview of documentation requirements. First, equipment setup is discussed, including a critical assessment of background, lighting, and camera features (camera, lens, and flash). Thereafter, a photographic series of 17 images is presented with patient photographs taken in both static (relaxed) and active (contracted) poses to highlight facial features. In summary, this chapter provides the clinician the necessary steps to adequately perform quality photography essential in today's marketplace.

Photography for Documentation

Medical photography is a means to accurately document patient features and conditions utilizing a device to capture an image or video. Photography has been utilized in medicine for over a century, and prior to that medical drawings and illustrations were considered the norm to portray disorders or changes to various medical conditions and transmit new information to colleagues. Today medical photography is more popular than ever, and its essential use in modern medicine is not only highly recommended but in some fields an absolute necessity. The field of facial esthetics and facial rejuvenation balances a fine line between medicine and cosmetics, and for this reason, it is the authors' recommendation that all doctors adhere to strict protocols when it comes to documenting facial esthetic procedures. Because photography is essential for documenting cases over time, patient files should be stored in secure places and digital files should be backed up in ideally two places.

Photography can also serve many other functions. Well-conducted photography can improve case acceptance because incoming referrals and new patients can visualize before and after photographs performed within that office, helping to build credibility and trust. Photography is also useful to facilitate treatment planning, monitor overall progress over time, research and optimize techniques, as well as improve office marketing.

Unfortunately, in the field of facial esthetics, there is an ever-growing number of "failed" procedures, protocols, and devices because of the number of low-grade products brought to market (eg, bargain facial fillers), resulting in lawsuits and negativity toward the field. Furthermore, with the increased visibility of facial rejuvenation procedures being performed on virtually all celebrities in modern culture, patient expectations have also increased tremendously. It is therefore anticipated that some patients will demonstrate some resistance following treatment, expressing that little to no effect or benefit was observed over time.

Patients forget fast, and photography therefore becomes essential.

Naturally, the most effective method to transmit information regarding changes to facial features is by properly and adequately documenting before and after photographs in a photographic series. This becomes particularly important when regenerating tissues with PRF, because a slow and gradual change is expected over time, unlike the instantly gratifying result that may be observed with facial fillers and/or Botox (Allergan). The photographic series demonstrated later in this chapter illustrates effective ways to bring out facial wrinkles and problem areas. These photographs may be captured predictably within a 2-minute period when the office is adequately set up.

General Requirements

Prior to any procedure commencing in a medical office or cosmetic spa, collection of all relevant patient medical history is essential. All treatments carried out must be well documented in each specific patient file, even if utilizing a totally natural regenerative approach such as with PRF. Even though no adverse reactions have been documented in the literature to date with PRF, it is always important to provide the patient with an array of possible treatment options with a full consultation that includes discussion of the relevant risks and potential complications of each treatment option prior to commencing any procedure. A written informed consent is also a requirement for all facial procedures performed.

One of the first steps following a thorough medical history assessment is a complete photographic series documenting the patient in both static and active poses. This is vital in order to accurately and objectively record the patient's facial features. These photographs are taken without makeup and allow the photographer (often a trained office assistant) to adequately visualize the entire face, including troublesome areas and/or facial aging features. Once completed, it is routine to allow patients to visualize their own facial photographic series. Allow time for patients to evaluate their own facial contour, features, and troublesome areas prior to beginning discussion

with the treating medical provider. During consultation, patients are more prone to disclose their troublesome areas, and the medical provider may then begin discussing realistic expectations for each treatment option provided within their facility.

Ideally, photography for facial esthetics should be performed in a dedicated space or room within the office. This will greatly assist in taking uniform photographs over time as the image distance, flash settings (both intensity and length), camera lens settings, as well as a variety of other options found in digital photography can be fixed, stationary, and therefore *reproducible*. Unfortunately, many practices do not function like this, and slight changes in any of these parameters (especially lighting) can have a drastic and marked impact on the final photograph. This chapter features a professional setup for adequate medical photography.

Background

The background can have a tremendous impact on the final photograph; a busy background can be distracting and result in less focus toward the troublesome facial areas (Fig 3-1). While some clinicians utilize a white door or a room divider as a background, the authors highly recommend the use of a background support stand with a white wrinkle-resistant backdrop (Fig 3-2). These can be purchased for under $100 and can offer great background clarity. We further recommend pure white seamless background paper (typically around $30), which can be rolled if wrinkles are observed over time.

FIG 3-1

A proper background can have a tremendous impact on the final photograph, because background disturbances can be distracting to the overall photograph. *(a)* Patient photograph with busy background. *(b)* Same patient with a seamless white background.

FIG 3-2

The authors recommend the use of a background support stand with a white wrinkle-resistant backdrop for facial photography.

FIG 3-3

Two types of cameras are typically used in facial esthetics. *(a)* Digital compact cameras are easy to use and offer a variety of preprogrammed image modes. They are inexpensive and relatively small in size. *(b)* Digital reflex cameras are the preferred choice because they offer a much wider range of accessories, high optical performance, and the ability to change lenses depending on function.

Camera and Lens

Many cameras are available in today's market, and it is often difficult to decipher the advantages and disadvantages of each. While digital compact cameras were once considered an easy-to-use photography device with preprogrammed image modes, they have limited applications in facial esthetics because they are incapable of utilizing indirect flash. Instead, clinicians should ideally purchase a digital reflex camera. A modern 20- to 30-megapixel model with low noise at 100 ISO speeds is preferred for the least noise with excellent detail and the greatest ability to reproduce detail in the brightest and darkest areas being photographed. These cameras offer numerous advantages: *(1)* the ability to include indirect flashes (multiple), *(2)* high optical performance, *(3)* the ability to change lenses, and *(4)* the ability to attach special accessories. While there is a learning curve to operate reflex cameras and a basic knowledge of photography is needed, most of the settings required are highlighted throughout this chapter to ease this learning curve (Fig 3-3). Ideally, the clinician should test various systems prior to purchase by taking long and close-up photographs of skin areas.

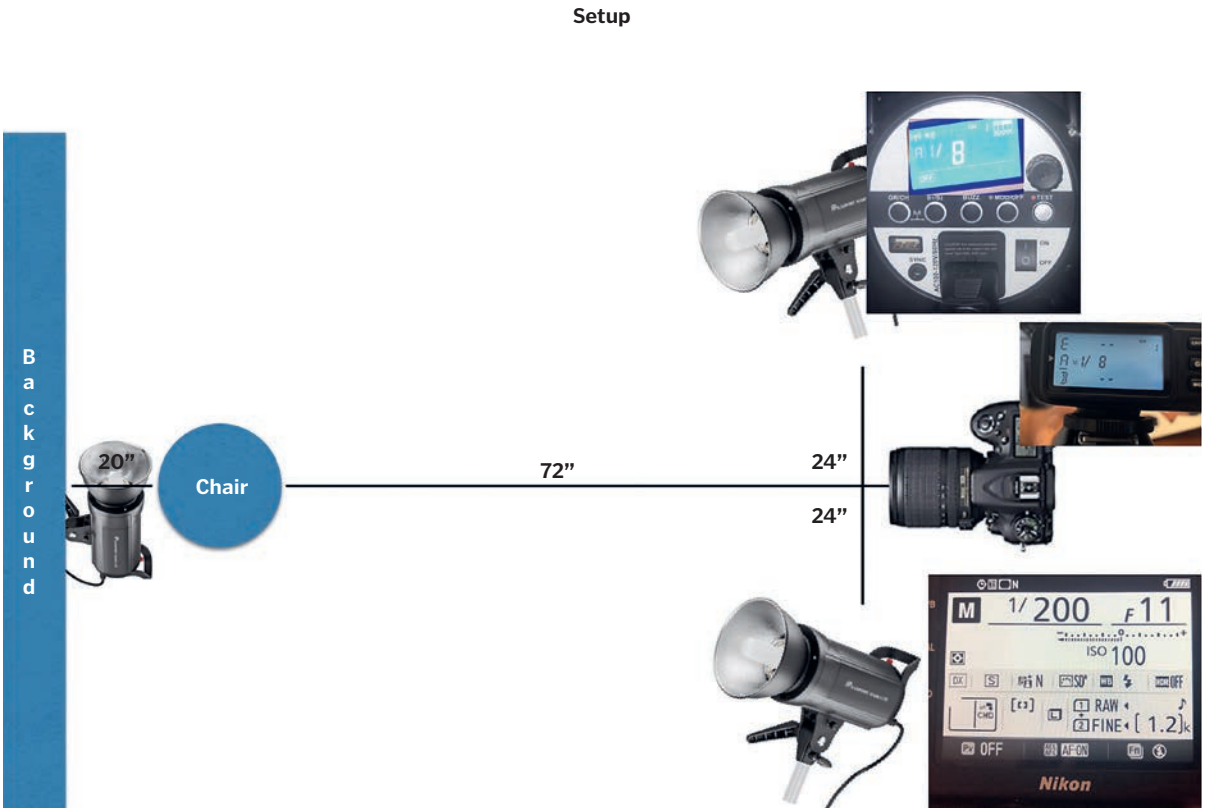

FIG 3-4

Recommended distance setup for an office to perform photography in facial esthetics. Note the three flashes: one behind the patient to avoid shadows, and two near the camera angled facing the patient on either side.

A basic set of requirements is necessary to take adequate photographs. Ideally, the operator and patient should be still. For these reasons, the patient should always be sitting upright, and the camera should be installed on a rigid tripod to minimize camera motion. The first or baseline shot of the documentation series should always be critically assessed to ensure that the lighting, focal spots, and image quality represent the office norm. The remaining photographs can then be taken. All images should be taken as perpendicular to the patient as possible.

As a general rule of thumb, a certain distance is needed from the patient in order to avoid having larger-than-usual central facial features (such as the nose), often encountered when the image distance is too small. The authors recommend a 6-feet distance from the patient as illustrated in Fig 3-4. While zoom shots were once captured in order to better visualize certain troublesome areas, the improvement in camera technology allows a single headshot to be taken and then zoomed in digitally to visualize specific areas with extremely high quality (Fig 3-5).

FIG 3-5

Demonstration that from a single headshot *(a)*, multiple areas can be visualized incredibly well with the zoom function due to improvements in technology of modern-day cameras. *(b)* Neck. *(c)* Forehead wrinkles. *(d)* Lower eyelid. *(e)* Nasolabial fold. *(f)* Jowls.

FIG 3-6

100mm Canon lens.

When it comes to camera lenses, an array of choices exists. We recommend a camera with a 100mm lens (Fig 3-6). A 100mm lens is the best choice because it is fixed and not subjected to inadvertent zoom changes. It provides uniformity. Furthermore, a camera distance of 6 feet just behind the flashes allows for the greatest enlargement with the 100mm lens. Moving the camera back further will produce a smaller image with lower resolution upon zoom. Wide-angled lenses should be avoided because they can produce undesirable distortions (fish eye perspective), which are not appropriate for facial documentation.

Once setup is complete, image quality will remain the same, so the setup process is very important and should be given serious effort.

TABLE 3-1

Camera model, lens, and camera settings for facial photography

Camera model	**Nikon D7200 or equivalent SLR**
Lens	100mm fixed or zoom to 100mm
Flashes	Flashpoint Studio 300 Monolight with Built-in R2 2.4GHz Radio Remote System
Flash set to	1/8 power
Camera set to	Manual
Shutter speed	1/160 sec
f-stop	F11
ISO	100
White balance	Flash

Lighting

Lighting can be complicated because every light source has different color temperatures with differing effects on color reproducibility. We highly recommend using the settings given in this book to ensure proper photography. Using the camera/flash settings given in Table 3-1 will ensure proper color balance and exposure. This will minimize and negate interference from room light. In general, it is assumed that artificial light sources will be utilized to document patients. When mixed light situations occur (daylight, various fluorescent lamps, or other types of lights), it increasingly complicates the ability to capture a photograph accurately. For an adequate method to measure light intensity, a histogram is recommended to calibrate the photograph (Fig 3-7). The histogram provides a graphic representation of the brightness distribution within a photograph, and this objectively allows the photographer to adjust conditions accordingly. Ideally, the image brightness should span across the entire histogram; the two ends represent dark *(left)* and bright *(right)* areas in the image. The highest peak in the histogram will always be located to the far right, which represents the background white (purest white). The rest of the photograph should appear to the left, and the peaks should end before the end of the frame, which represents total black (see Fig 3-7b). We recommend a set of Studio Monolight flashes. In this set of three, two flashes come angled facing the patient on each side, and one is located behind the patient to avoid backdrop shadows (see Fig 3-4).

With respect to lighting, the proper ISO speed, lens aperture, and flash unit performance all need to be considered and adjusted accordingly. Hiring a professional photographer during setup is highly recommended as a one-time consultation because they can work through minor issues with much more effectiveness than can most clinicians (Fig 3-8).

Previously, some clinicians recommended direct (on-camera) flash light versus indirect flash (Fig 3-9). We personally prefer indirect flash light because the light may better detect facial features more readily, and it provides more uniform lighting throughout the face. Some disadvantages, however, are that indirect light requires more powerful flash units, the room needs proper setup, it requires an adequate flash transmitter from the camera, and it also requires a higher degree of technical experience.

FIG 3-8

It is highly recommended to hire a professional photographer during the setup and management of digital photography to help set up the overall landscape and lighting. Thereafter, it becomes easy to reproduce images from session to session.

FIG 3-7

Three images taken of the same person in *(a)* underlit, *(b)* normal, and *(c)* overlit intensities. Notice the subsequent histograms for each image. Ideally, a well-spanned histogram should be observed following image capture.

FIG 3-9

Differences between on-camera flash *(a)* versus indirect flash *(b)*. Notice that in direct flash *(a)*, more shadows are created along the sides of the person's face, whereas indirect flash has a better ability to capture those locations.

Taking the Photographs

Photographs should ideally be taken in a dedicated office space where lighting, patient position, and distance to the camera can be controlled and reproduced predictably. Figure 3-4 demonstrates the setup with highlighted recommended distances for offices. This is an excellent starting place for new medical providers who wish to jump into facial esthetics for the first time with limited space requirements (8 to 10 feet total). The recommended settings are presented in Table 3-1. All settings should be used as given. The only variable should be the f-stop, which is used to make a final fine tune of the histogram. This may vary from clinic to clinic. All other parameters remain fixed to ensure the highest quality. If you lower the f-stop number, the exposure increases and moves the histogram to the right. If you increase the f-stop number, the exposure will decrease and moves the histogram to the left.

In the event that a photograph is taken with a need for measurement (eg, the size of a benign skin tumor), typically a 6-inch ruler is included within the photograph.

Documentation Series

The photographic documentation series is one of the first and most important steps when acquiring new patients for facial esthetics. Shortly following the information session and a thorough review of the informed consent sheets, the patient is asked to remove any makeup and jewelry and prepare for a series of facial photographs aimed at revealing potential problematic areas. It is important to plan this first appointment with an appropriate time slot for consultation and photography. This allows the patient's concerns to be explored comprehensively and completely in a professional manner. Listening to patient concerns and then providing a documented photographic series is a highly effective approach to treatment, especially in offices that can show before and after photographs of patients who were effectively treated for similar issues.

In the facial esthetic field, it is also a benefit not to rush this first appointment, because typically patients who enroll in facial rejuvenation programs are long-term clients. Therefore, if the treatment outcome initially satisfies the patient, the opportunity then exists to create a solid and long-lasting patient relationship. Furthermore, a positive treatment outcome will surely lead to growth by word of mouth, the ideal form of practice growth.

FIG 3-10

Images 1 through 5 of the facial esthetic photographic series, including two profile views, two oblique views, and a frontal view of the patient while the face is relaxed.

Tip: Most camera brands allow the user to select multipoint or single-point focus points. A single point must be selected, and it must be the center point only. For technical reasons, this will ensure the most accurate photograph; otherwise, much of the face will be out of focus. On a Canon camera, for instance, the sharpening should be set to the maximum in the camera's dropdown menu. The focus point should be placed over the subject's nostril for the frontal and oblique view shots. For the profile shots, the earlobe area where there is contrast or the corner of the lip should be used. These focus points are near the same plane that the cheeks and forehead lie on, which brings the entirety of the image into proper focus.

The PRFEDU facial esthetic photographic documentation series, established by Advanced PRF Education (www.prfedu.com), includes a series of 17 photographs in both static (relaxed) and active (contracted) poses to highlight facial features. First, a set of five relaxed photographs is taken: a frontal image, two 45-degree (oblique) images, and two sagittal (profile) images (Fig 3-10). Then a series of active photographs begins. First, the patient is asked to contract the neck muscles with clenched teeth (expression of sadness), and three images are taken at different angles: a frontal image and two oblique images (Fig 3-11). These same three photographs are taken with the patient actively smiling (Fig 3-12). The patient is

FIG 3-11

Images 6 through 8 of the facial esthetic photographic series, including three different angles of the patient with contracted neck muscles and clenched teeth.

FIG 3-12

Images 9 through 11 of the facial esthetic photographic series, including three different angles of the patient actively smiling.

then asked to squint like they are in a sandstorm to allow for adequate wrinkle formation of crow's feet. Once again three photographs are taken here from frontal and oblique angles (Fig 3-13). Lastly, a series of three photographs is taken with only the frontal view showing. These include *(1)* scrunching of the nose to allow for the nose and lip area to reveal aged wrinkles (Fig 3-14), *(2)* lifting of the eyebrows to reveal line wrinkles in the forehead area (Fig 3-15), and *(3)* pulling of the skin of the cheek outward (Fig 3-16). This final photograph is utilized to observe skin tightening over time following therapy, because certain modalities (such as microneedling) are known to effectively tighten skin and reduce skin laxity.