

Clinical Anatomy of the Face for Filler and Botulinum Toxin Injection

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Preface

First, I would like to thank my friend, Dr. Kyle Seo, for organizing all the extremely important clinical information and tips. I also wish to thank Dr. Hong-Ki Lee for his insightful inquisitions and questions that made coming up of creative contents possible. Also, I give my thanks to Dr. Jisoo Kim, who played a strong role in the planning of cadaver dissection workshops and in other works related to organizing necessary contents. Without the efforts and sacrifice of the above individuals in providing clinical manuscripts and in revising all of the visuals despite their busy clinical schedules, this book's text and artwork would not have been able to shine. As such, I send infinite thanks to Dr. Kwan-Hyun Youn for providing all of the visuals for this book. I believe that Dr. Youn, an art major graduate with a PhD in Anatomy, has raised our country's medical illustrations to that of world class. Many thanks to the effort of the Medart team led by Dr. Youn to make this book to have many clear, simple, and creative visual contents to be possible.

In the Fall of 2011, my research on clinical anatomy research in relation to aesthetics—and through this, teachings on clinical anatomy—started after receiving advice from John Rogers, a US neurology specialist and medical director of the Pacific Asian region for Allergan Inc., who visited my anatomy lab. Rogers, who had no particular interest in aesthetic treatments, enabled me to devote myself more to this field. Through regional and international educations, I had presented basic information on new methods regarding aesthetic treatment guidelines based on anatomy in order to avoid complications. Then, after hearing that many regional doctors were following anatomic guidelines based on Western research, the coauthors and I designed this book to introduce new methods to fit for Asians, who have slightly different anatomic features. For instance, Asians possess different locations of the modiolus, different directions and changes of facial arteries, and different attachment regions for muscles unlike to Caucasians. All of these and more are explained in detail in this book using research papers presented during my lectures as foundational information. Through this, new injection techniques are described in the book.

Current medical techniques are rapidly changing due to the development of science. As a result, this trend is giving way to a new slogan for medicine such as “borderless” and “above and beyond the border” for a movement working to dismantle academic borders. Biocompatible fillers and botulinum toxin injection development have started to create a new medical field of non-invasive aesthetic plastic surgery, referred to as ‘Beauty Plastic Surgery’, and

the desire for new medical techniques is bringing about developments in clinical anatomy. Likewise, I feel that it is right for clinical doctors from all fields to come together as a virtuous group to jump over the wall of traditional medicine for the development of medical practices. And, as a health personnel studying basic medicine, I feel immense responsibility and a sense of worth in being a part of this movement.

This book includes various images and pictures for simpler understanding of anatomy from ‘Plastic and Reconstructive Surgery’ and other 80 research papers from acknowledged journals in relation to clinical anatomy. In addition, we worked to include various documents about Koreans so that it may be utilized as a useful document in other areas. It is my wish that, through this book, readers are able to learn clinical techniques related to aesthetic treatments and to grow in knowledge regarding the prevention of complications.

I also thank Professor Kyungseok Hu and my graduate student Sang-Hee Lee, You-Jin Choi, Hyung-Jin Lee, Jung-Hee Bae, Liyao Cong, and Kyuho Lee from Yonsei University College of Dentistry who actively helped search for visual information and aided in other revision works for this book. Lastly, I would like to thank Dr. Yoonjung Hwang, Mr. Sanghoon Kwon, Juyong Lee, Yongwoong Lee and Ms. Hwieun Hur, and Young-Gyung Kim in translating the Korean manuscript of this textbook.

On the behalf of the authors,

Seoul, South Korea
November, 2015

Hee-Jin Kim

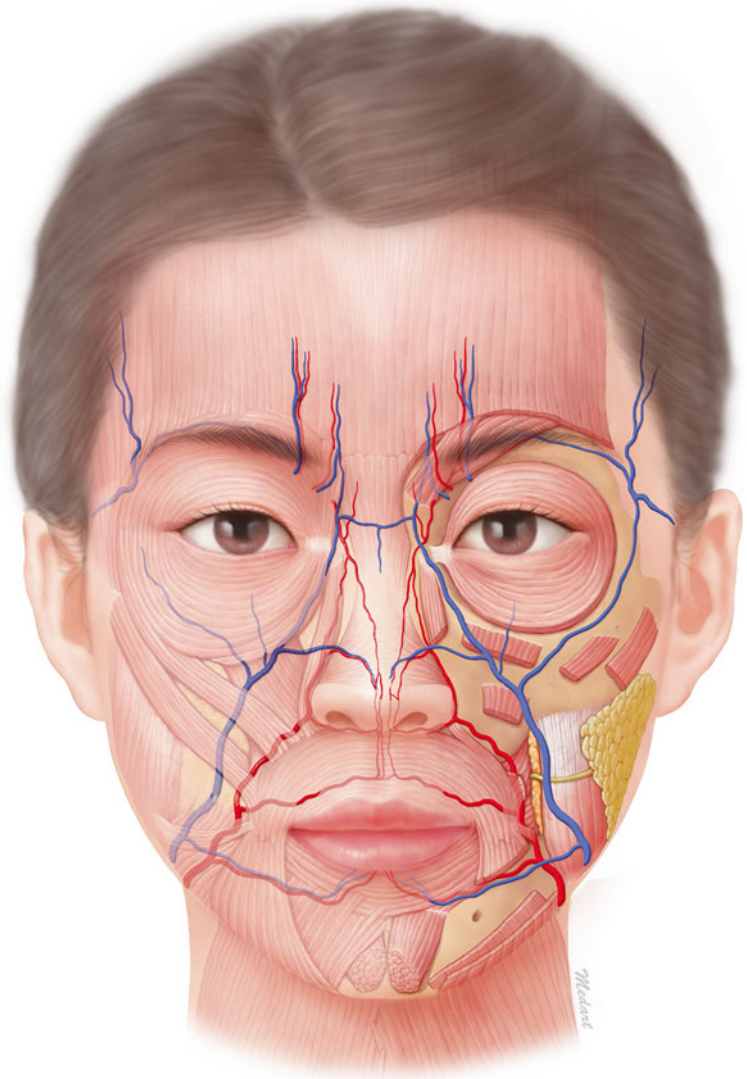
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Hee-Jin Kim (Illustrated
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1.1 Aesthetic Terminology

Inconsistencies exist between anatomical and aesthetic terminology. We attempt to redefine common clinical terms according to anatomical regions (Fig. 1.1).

1.1.1 Basic Aesthetic Terminology

Facial Creases

Facial creases are deep, shallow creases caused by changes in the structural integrity of the skin. It occurs due to loss of skin and muscle fiber elasticity caused by repetitive facial movements and changes in facial expressions. Creases are generally termed wrinkles and lines. Other terms such as furrow, groove, and sulcus are used in the clinical fields.

Skin Folds

Skin folds occur due to sagging, loss of tension, and gravity. Representative skin folds are the nasolabial fold, the labiomandibular fold, etc.

Baggy Lower Eyelids (or Cheek Bags, Malar Bags)

Baggy lower eyelids occur due to a drooping of the adipose tissue underneath the orbicularis oculi m. This should be distinguished from the festoon since the baggy lower eyelid occurs inferior to the orbital margin.

Blepharochalasis

Blepharochalasis occurs due to sagging of the eyelid skin.

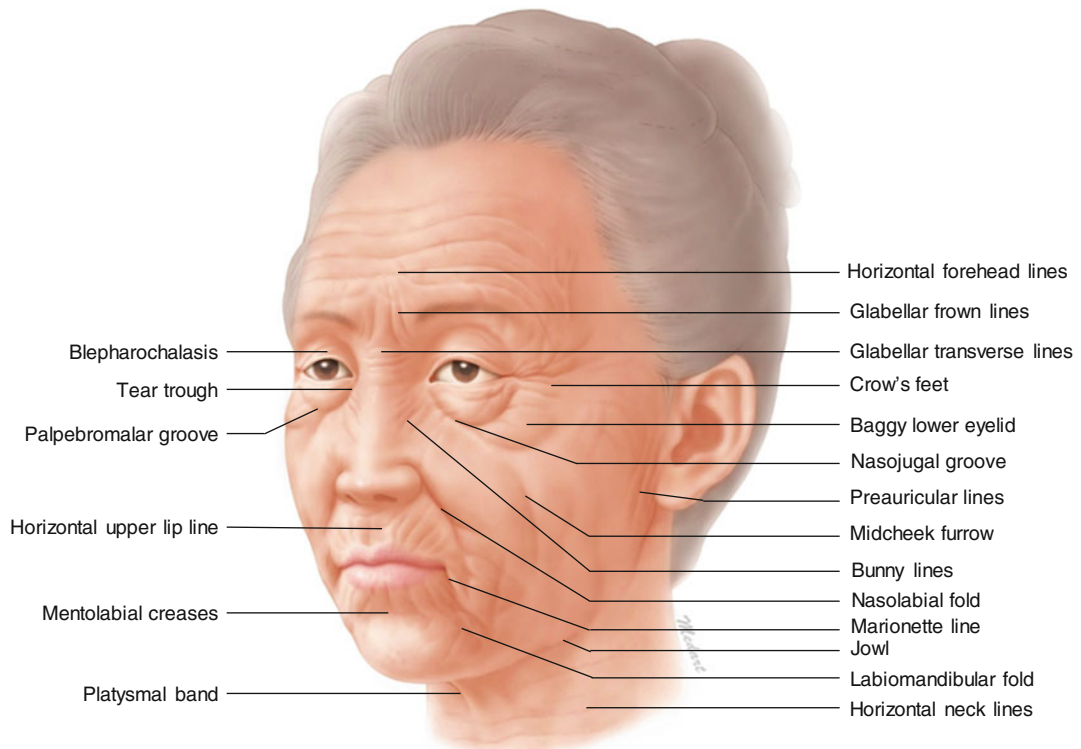


Fig. 1.1 Aging facial creases and wrinkles (Published with kind permission of © Kwan-Hyun Youn 2016. All rights reserved)

Bunny Line

The bunny line is the oblique nose furrows lateral to the nose bridge that is pronounced by various facial expressions. The levator labii superioris alaeque nasi m. below the skin and the medial muscular band of the orbicularis oculi m. participate in the formation of the bunny line.

Commissural Lines

Commissural lines are short, vertical lines appearing on each sides of the mouth corner. Occasionally, deep creases may form starting from the perioral regions.

Crow's Feet (Lateral Canthal Wrinkles)

Crow's feet are thin, bilateral wrinkles at the lateral sides of the eyes formed by the orbicularis oculi m.

Festoon

Festoon is the bulged appearance of the lower eyelids caused by a sagging of the skin and of the orbicularis oculi m. and by a protrusion of the inferior orbital fat compartment underneath the orbital septum.

Horizontal Forehead Lines (Worry Lines)

Horizontal forehead lines are horizontal lines across the forehead region where the frontalis m. is located.

Glabellar Frown Lines (Glabellar Creases or Lines)

Glabellar frown lines are vertical creases along the glabellar region caused by the corrugator supercilii muscle fibers.

Glabellar Transverse Lines

Glabellar transverse lines are horizontal lines on the radix that are typically produced during facial distortion. They occur perpendicular to the fibers of the procerus m.

Gobbler Neck (Platysmal Bands)

The gobbler neck appears as bilateral vertical skin bands on the neck along the anterior cervical and submental region. This occurs due to sagging of the medial border of the platysma muscle.

Horizontal Neck Lines

Horizontal neck lines are horizontal skin folds on the anterior cervical region. They are produced by a combination of platysmal muscle fibers and sagging neck skin.

Horizontal Upper Lip Lines (Transverse Upper Lip Lines)

Horizontal upper lip lines are 1–2 horizontal lines located at the philtrum on the upper lip.

Jowl (Jowl Sagging)

Jowl is the protrusion and sagging of the subcutaneous adipose tissue along the mandibular border. The anterior border of the prejowl sulcus clearly signifies the existence of mandibular retaining ligaments.

Oral Commissure

The labial commissure is the region where the upper and lower lips join on each lateral side. The joining point is referred to as the cheilion.

Labiomandibular Fold

The labiomandibular fold spans from the corner of the mouth to the mandibular border and becomes prominent with age. The depressor anguli oris m. (DAO) defines the fold's medial and lateral borders. The attachment of the mandibular retaining ligament causes the labiomandibular fold to be located more anteriorly and medially.

Marionette Line

The marionette line is a long, vertical line that proceeds inferiorly from the corner of the mouth.

It occurs commonly with age but with unknown causes. It is more pronounced in people with less fat tissues than in those with more fat tissues. This line is also called the “disappointment line.”

Mentolabial Creases (or Furrows)

Mentolabial creases are horizontal creases (one or more) between the lower lip and the chin (mentum). These creases lie between the orbicularis oris m. and the mentalis m.

Midcheek Furrow (Indian Band)

The midcheek furrow is a downward and lateral band, or furrow, that extends the nasojugal groove from the lateral aspect of the nose to the region superior to the anterior cheek. This band may carry on inferior to the cheek. With age, the cheek and the midface droop inferiorly and medially, and the band forms along the inferior margin of the zygomatic bone at the same height where the zygomatic cutaneous ligament attaches to the skin in this region.

Nasojugal Groove

The nasojugal groove is formed at the border between the lower lid and the cheek and runs inferolaterally from the medial canthus. The nasojugal groove region corresponds with the lower border of the orbicularis oculi m. and becomes more pronounced with the existence of the medial muscular band of the orbicularis oculi m. With age, this groove obliquely continues downward to the midcheek furrow.

Nasolabial Fold (or Nasolabial Groove)

The nasolabial fold starts from the side of the nasal ala and extends obliquely between the upper lip and the cheek. With age, the subcutaneous adipose tissue of the anterior cheek sags, causing the fold to deepen and move downward. The adipose tissue of the anterior cheek cannot descend inferior to the nasolabial fold due to compact attachment of the fascia, the skin, the cutaneous insertions of upper lip elevator

muscles, and the zygomaticus major m. into the skin in this area. In addition, the facial area tends to lie underneath the nasolabial fold with variable depths.

Palpebromalar Groove

The palpebromalar groove is the border between the lower lid and the malar region.

Preauricular Lines

Periauricular lines are several vertical skin lines located near the tragon, the ear lobule, and the anterior region of the auricles.

Ptotic Chin

The ptotic chin is a flat and contracted chin associated with a deepened submental crease.

Tear Trough

The tear trough is a line originating from the medial canthus and proceeding inferolaterally along with the infraorbital margin. With age, the inferior and medial portions of the orbit sink due to contraction of the soft tissues (skin, muscle, and fat) covering the area. The tear trough has various forms according to how the medial part of the orbicularis retaining ligament and the fibers of the medial muscular band of orbicularis oculi m. come into contact with the skin.

Temple Depression

Temporal depression is the gradual decrease in volume of the soft tissues of the temporal region expressed with age. The bone structure of the temporal crest becomes more pronounced.

Vertical Lip Line

As aging is processed, the tooth is lost and alveolar bone is absorbed. It leads perioral muscle and lip contracts, so the vertical lip line appears along the vermilion border.

1.2 Layers of the Face

1.2.1 Layers of the Skin

Basic facial soft tissues are composed with five layers: (1) skin, (2) subcutaneous layer, (3) superficial musculoaponeurotic system (SMAS),

(4) retaining ligaments and spaces, and (5) periosteum and deep fascia. Facial skin can move over the loose areolar connective tissue layer with the exception of the auricles and the nasal ala, which are supported by the cartilage under the skin. Facial skin contains numerous sweat and sebaceous glands (Fig. 1.2a, b).

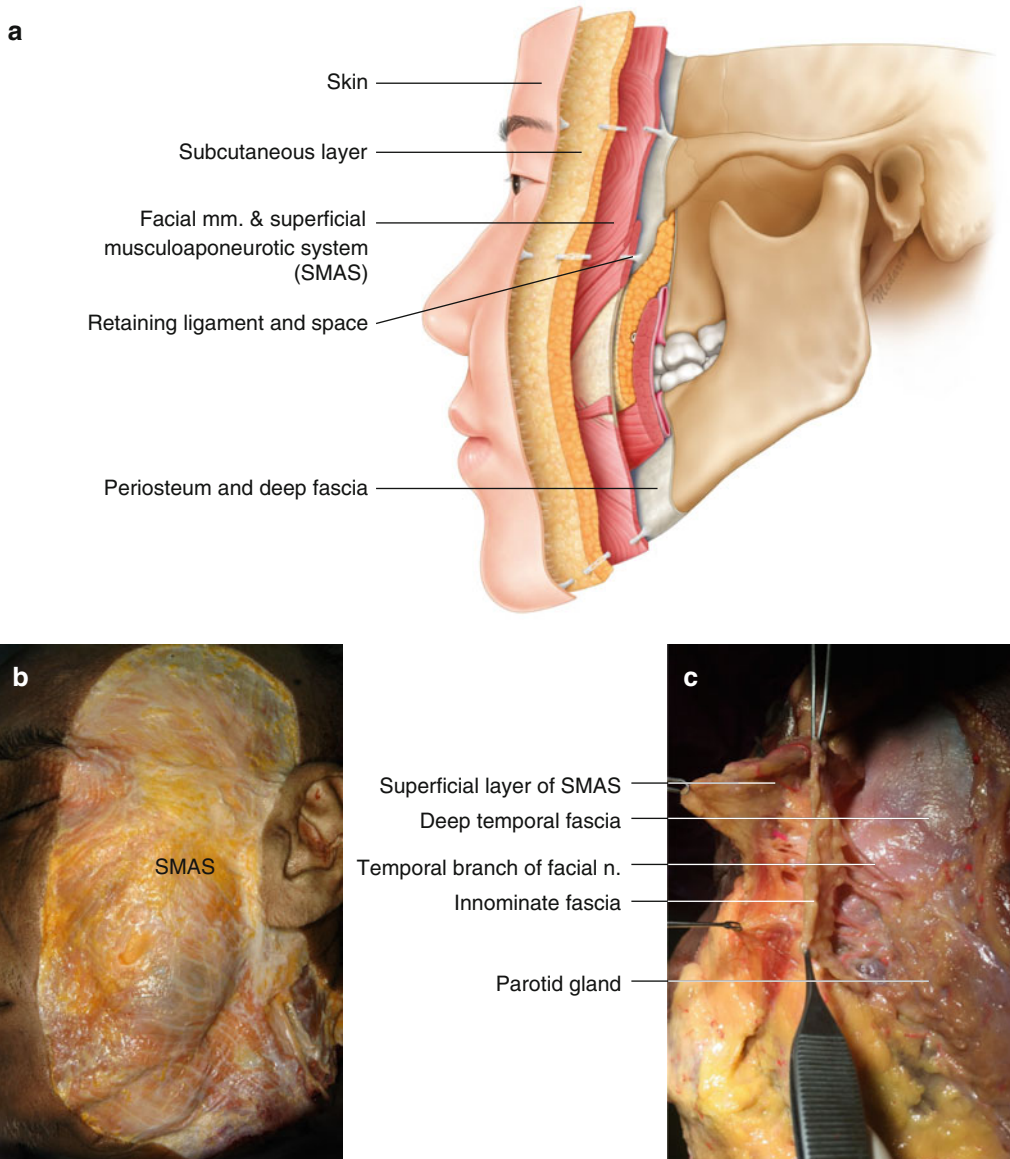


Fig. 1.2 Anatomical layers of the face. (a) Basic five layers of the face, (b) SMAS (superficial musculoaponeurotic system), (c) reflected SMAS at the lateral aspect of

the face (Published with kind permission of © Hee-Jin Kim, Kwan-Hyun Youn and Joo-Heon Lee 2016. All rights reserved)

Among the subcutaneous fat tissue of the face, superficial fat is divided into malar, nasolabial fat, and so on. However, the boundary is not visible to the naked eye and the superficial fat may seem to cover the whole face. Deep fat is placed in the deeper part of the facial muscle and is demarcated by dense connective tissues such as the capsules or retaining ligaments. The color and properties of the deep fat show different characteristics from the superficial fat. Suborbicularis oculi fat (SOOF), retro-orbicularis oculi fat (ROOF), buccal fat, and deep cheek fat are included in the deep fat of the face. Fibrous connective tissues pass through facial fat tissues and play in role in connecting the fat tissue, facial muscles, dermis, and bone (Figs. 1.3 and 1.4).

The superficial fascia, or subcutaneous connective tissue, contains an unequal amount of fat tissue, and these fat tissues smoothen the facial contour between facial musculatures. In some areas, fat tissues are broadly distributed. The buccal fat pad forms the bulged cheek and continues to the scalp and the temple region. The facial v., the trigeminal nerve, the facial nerve, and the superficial facial muscle are contained within the subcutaneous tissue (Fig. 4.27).

The SMAS (superficial muscular aponeurotic system) is the superficial facial structure

composed of muscle fibers and superficial facial fascia. It is a continuous fibromuscular layer investing and interlinking the facial m. The SMAS extends from the platysma to the galea aponeurotica and is continuous with the temporoparietal fascia (TPF, superficial temporal fascia) and the galea layer. It is known that the SMAS consists of three distinct layers: a fascial layer superficial to the muscles, a layer intimately associated with the facial m., and a deep layer extensively attached to the periosteum of facial bones (Fig. 1.2c).

1.2.2 Thickness of the Skin

The general thickness of the facial skin is described in the figure below. When treating in areas with thin layers of skin, a filler injection should be cautiously performed while trying to avoid shallow filler placement. Upper and lower eyelids, glabellar regions, and nasal regions have an exceptionally thin skin layer. On the other hand, the skin layer of the anterior cheek and the mental region are relatively thicker. During filler treatment, the skin's flexibility and internal space should also be considered along with its thickness (Fig. 1.5).

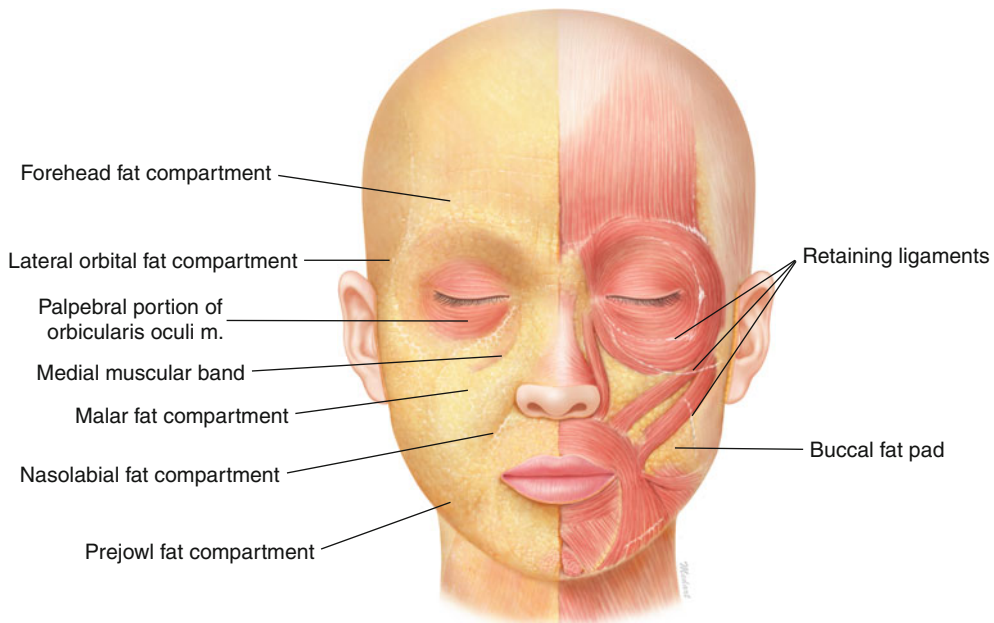


Fig. 1.3 Superficial fat and superficial muscles of the face (Published with kind permission of © Kwan-Hyun Youn 2016. All rights reserved)

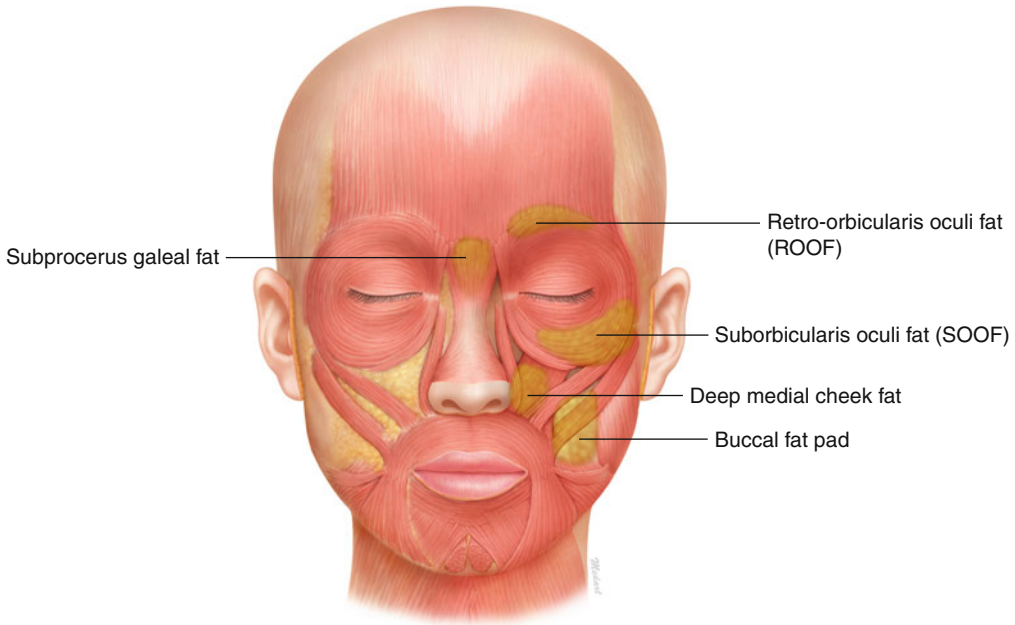


Fig. 1.4 Deep fat compartments of the face (Published with kind permission of © Kwan-Hyun Youn 2016. All rights reserved)

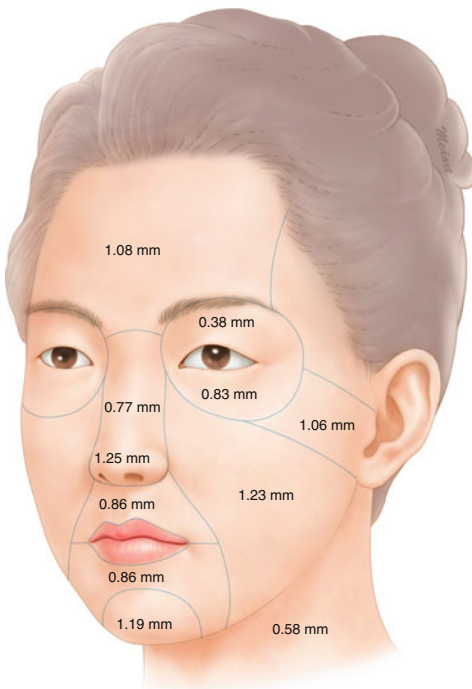


Fig. 1.5 Average skin thickness of the face (Published with kind permission of © Kwan-Hyun Youn 2016. All rights reserved)

1.3 Muscles of Facial Expressions and Their Actions

Facial m. are attached to the facial skeleton, or membranous superficial fascia, beneath the skin, or subcutaneous tissue. The topography of the facial m. varies between males and females and between individuals of the same gender. It is important to define muscle shapes, their associations with the skin, and their relative muscular actions in order to explain the unique expressions people can make.

The face divides into nine distinct areas: (1) the forehead including glabella from eyelids to hair line, (2) temple or temporal region anterior to the auricles, (3) orbital region, (4) nose region, (5) zygomatic region, (6) perioral region and lips, (7) cheek, (8) jaws, and (9) auricle.

These muscles are distributed in different locations and (1) direct the openings of the orifices as dilators or sphincters and (2) form various facial expressions. These facial muscles, located within the superficial fascia, or subcuta-

neous tissue layers, originate from the facial bone or fascia and attach to the facial skin. They reveal various expressions such as sadness, anger, joy, fear, disgust, and surprise.

Facial mm. are widely distributed in different regions of the face. However, they are generally categorized different regions such as the forehead, the orbital, the nose, and other perioral regions. The platysma m., which is involved in the movement of the perioral region, is also considered a facial muscle (Fig. 1.6).

1.3.1 Forehead Region

The occipitofrontalis m. is a large, wide muscle underlying the forehead and the occipital area. It is divided into the frontal belly of the forehead

region and the occipital belly of the occipital region. Clinically, the frontal belly of the occipitofrontalis m. is referred to as the “frontalis muscle” and arises from the galea aponeurosis and inserts into the orbicularis oculi m. and the frontal skin above the eyebrow. The width and contraction of the frontalis m. vary between individuals; during an individual’s anxiety and surprise, this muscle produces transverse wrinkles on the forehead.

The frontalis m. is rectangular and possesses bilateral symmetry. Its muscle fibers are vertically oriented and join the orbicularis oculi and the corrugator supercilii m. near the superciliary arch of the frontal bone. The frontalis m. lies beneath the skin of the forehead (3–5 mm in average), though depth can differ considerably (27 mm) between individuals (Fig. 1.7).

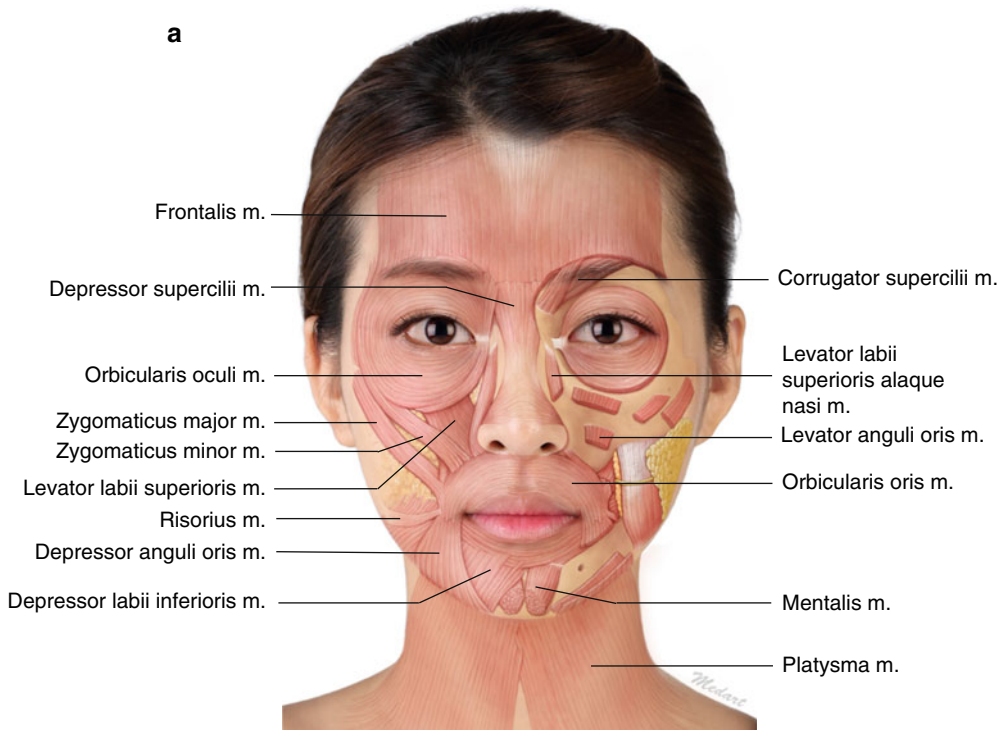


Fig. 1.6 Facial muscles. (a) Frontal view, (b) lateral view, (c) oblique view (Published with kind permission of © Kwan-Hyun Youn 2016. All rights reserved)