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Neuromodulator Treatments: Forehead

The forehead is a highly mobile facial region that is predominantly influenced by the contractions of the frontalis muscle. The frontalis muscle is a muscle of facial expression that receives motor innervation from the frontal branches of the facial nerve. The nerve fibers enter the forehead from the lateral side, passing through the temple, and connect with the frontalis muscle from below, thereby forming neuromuscular junctions at the muscle's undersurface.

The innervation pattern is dispersed throughout the entire extent of the frontalis muscle and is not condensed in specific areas of the forehead.

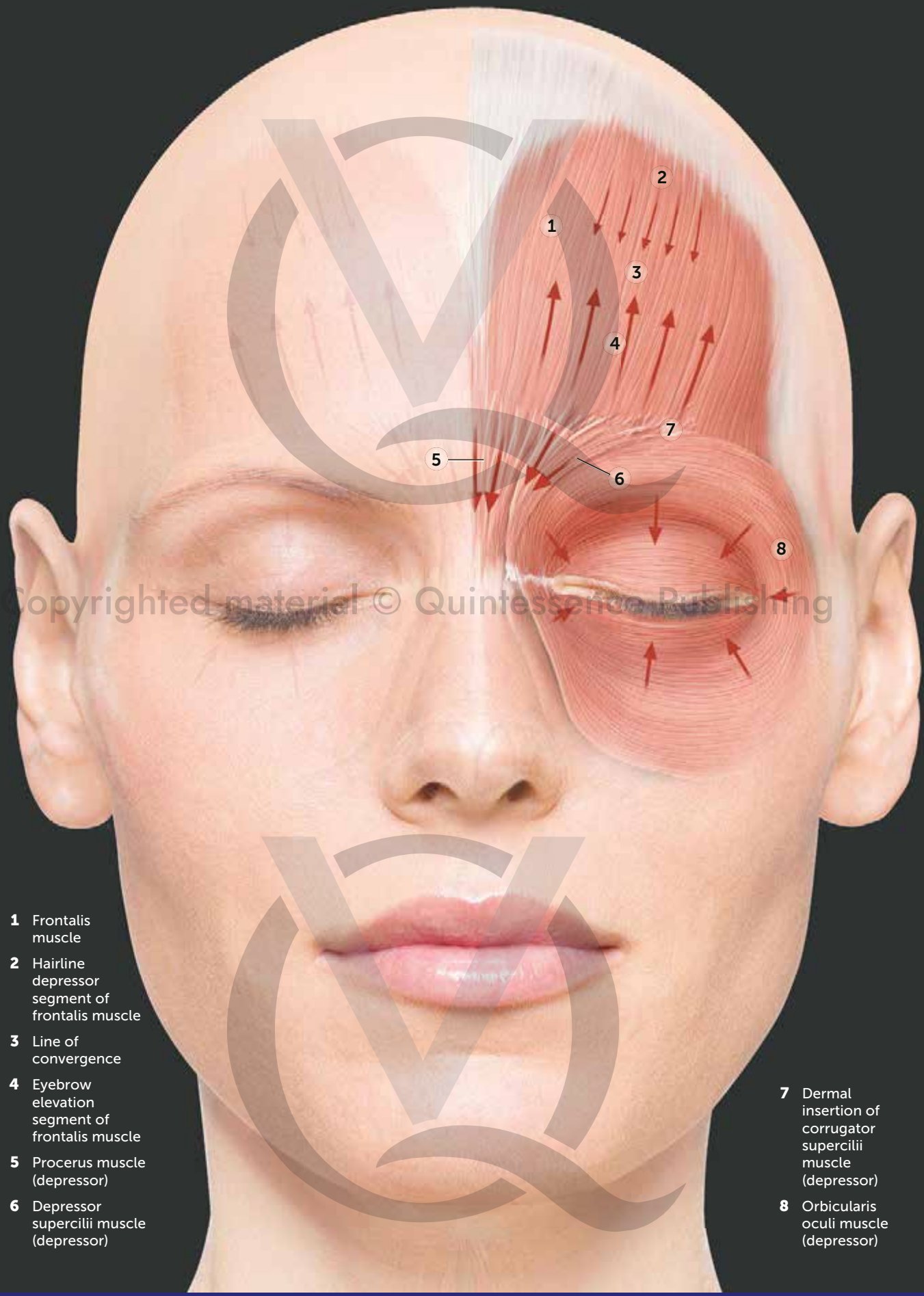
Upon activation, the frontalis muscle contracts and moves the skin in a perpendicular direction to the muscle fiber orientation: More vertically oriented fibers result in straight horizontal forehead lines, and more angled fibers result in wavy forehead lines.

Contraction of frontalis muscle fibers results in a shortening of the forehead, with the hairline moving caudally and the eyebrows moving cranially. Both movements converge at around 60% of the total forehead length, creating a horizontal immobile region termed the *line of convergence*.

The frontalis muscle is opposed in its eyebrow elevation by three separate depressor muscles:

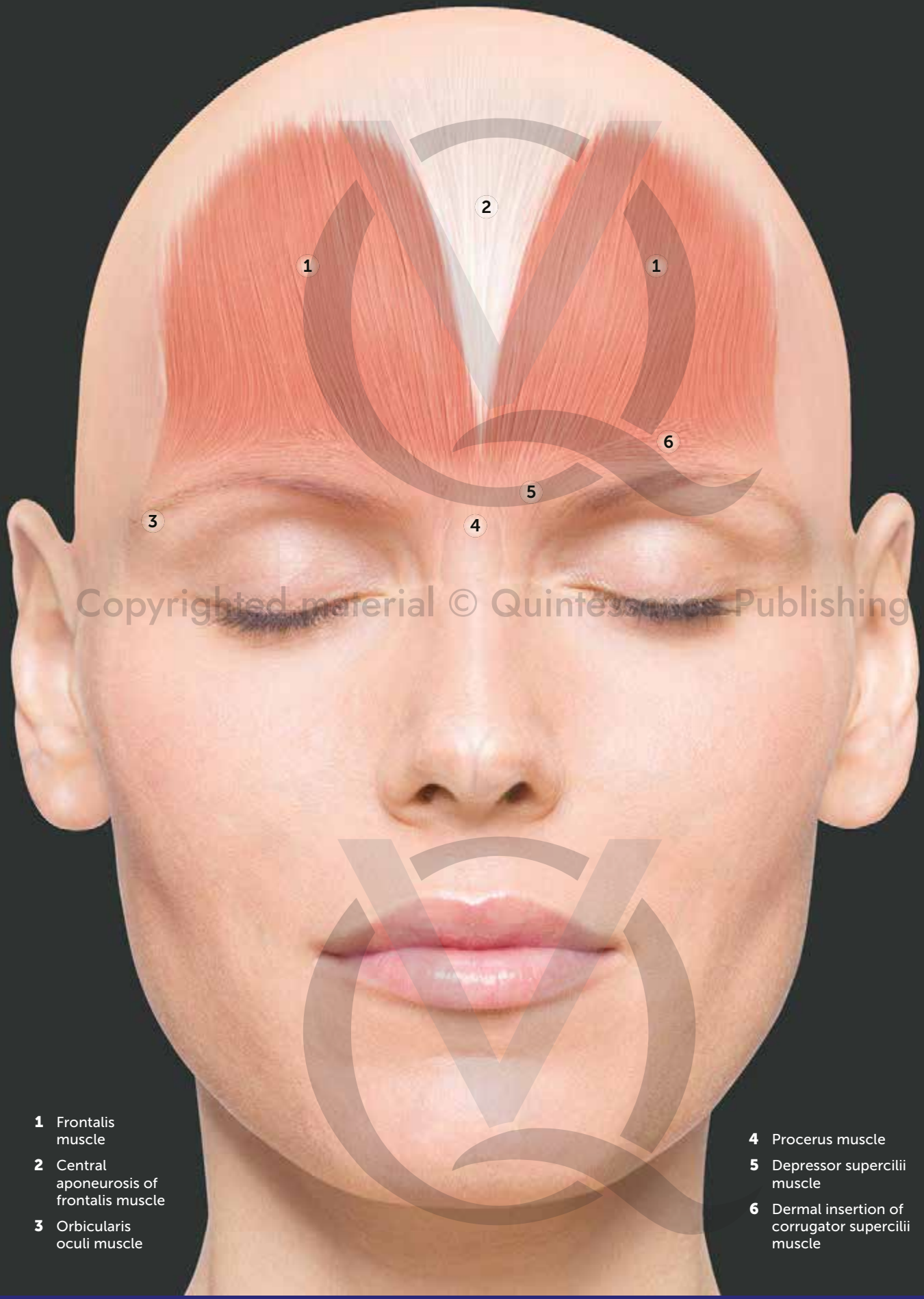
- → In the midline: Procerus muscle
- → In the central portion of the eyebrows: Corrugator supercilii muscle
- → In the lateral portion: Orbicularis oculi muscle

Together, these antagonistic pairs form axes of movement that position the eyebrows during various facial expressions.



1 Frontalis muscle
2 Hairline depressor segment of frontalis muscle
3 Line of convergence
4 Eyebrow elevation segment of frontalis muscle
5 Procerus muscle (depressor)
6 Depressor supercilii muscle (depressor)
7 Dermal insertion of corrugator supercilii muscle (depressor)
8 Orbicularis oculi muscle (depressor)

Contraction direction of the muscles involved in eyebrow positioning.



1 Frontalis muscle

2 Central aponeurosis of frontalis muscle

3 Orbicularis oculi muscle

4 Procerus muscle

5 Depressor supercilii muscle

6 Dermal insertion of corrugator supercilii muscle

Muscles of the forehead region.

Neuromodulator Treatments: Glabella

The arrangement of the glabellar musculature is complex, as all muscles in this region interconnect with each other and have a 3D instead of a 2D orientation. The different glabellar muscles all act together as eyebrow depressors and are opposed by the antagonistic elevator function of the frontalis muscle. Depending on the dermal attachment of each muscle, four different axes of movement can be identified, which help to move and position the eyebrow:

1. Medial vertical axis (elevator vs depressor): Frontalis muscle vs procerus muscle
2. Middle vertical axis (elevator vs depressor): Frontalis muscle vs corrugator supercilii muscle
3. Lateral vertical axis (elevator vs depressor): Frontalis muscle vs orbicularis oculi muscle
4. Horizontal axis (medial vs lateral): Orbicularis oculi muscle/corrugator supercilii muscle vs frontalis muscle/orbicularis oculi muscle

The balance between these four axes of movement determines the position of each portion of the eyebrow (medial/central/lateral) and influences the skin rhytid pattern in conjunction with the skin, the subdermal fatty layer, and the 3D connective tissue network.

Understanding that multiple factors contribute to the formation of specific skin rhytids or rhytid patterns allows clinicians to "read" the clinical presentation and then translate it into an individual neuromodulator injection algorithm, keeping in mind that neuromodulators affect muscles and not the soft tissues when a reduction in wrinkle severity is desired.

Recent research has revealed that during various facial expressions, both the agonistic and the antagonistic muscles of the periorbital region are active at the same time. This understanding is crucial when the magnitude of the clinical outcome has to be predicted.

Neuromodulators have their chemical effect at the neuromuscular junction, ie, the transition point between nerve and muscle fiber. The distribution of the neuromuscular junctions has been shown to be condensed at the muscles' origin in fusiform or pennate facial muscles (procerus or corrugator supercilii muscles), whereas in flat, 2D muscles (frontalis or orbicularis muscles), the neuromuscular junctions are distributed equally across the entire muscle surface area. Therefore, it is understandable that current injection algorithms for treating glabellar rhytids are focused on the administration of neurotoxins at the origin of the procerus and corrugator supercilii muscles but target the frontalis and orbicularis oculi muscles across their entire muscle body.

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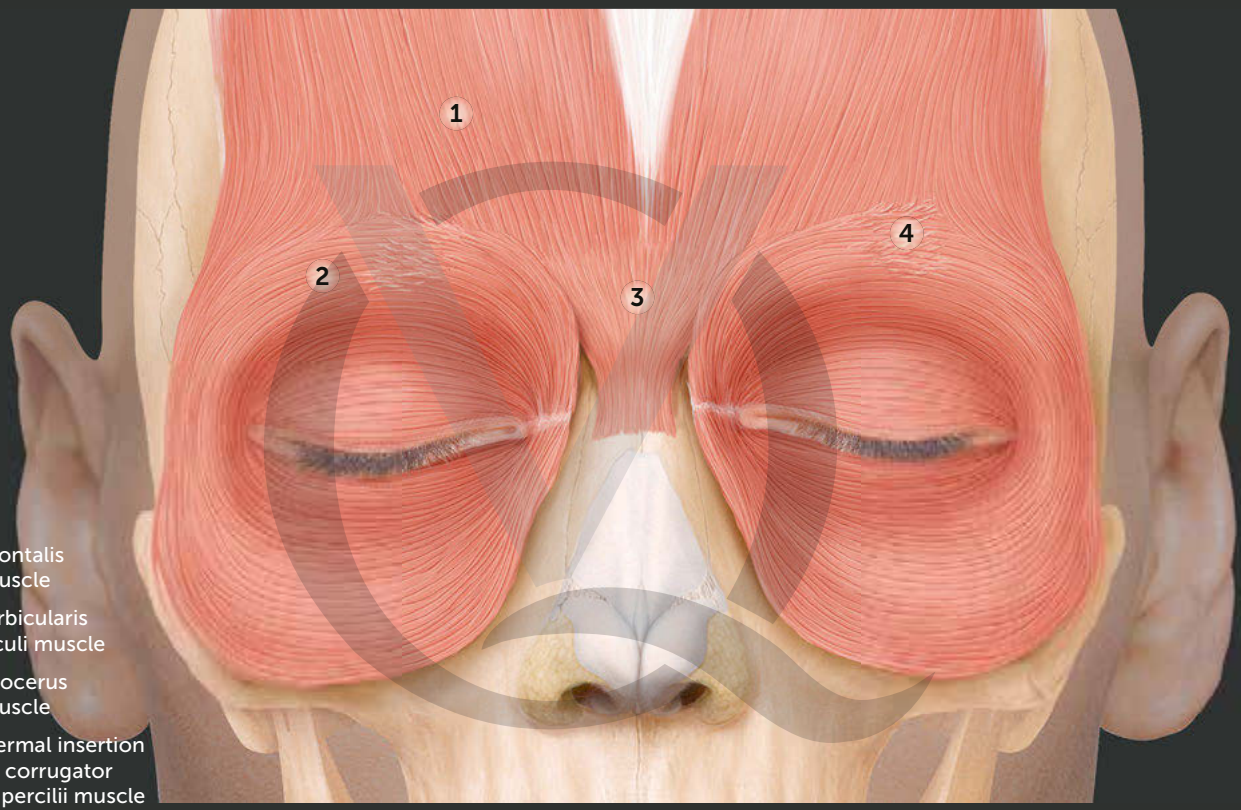
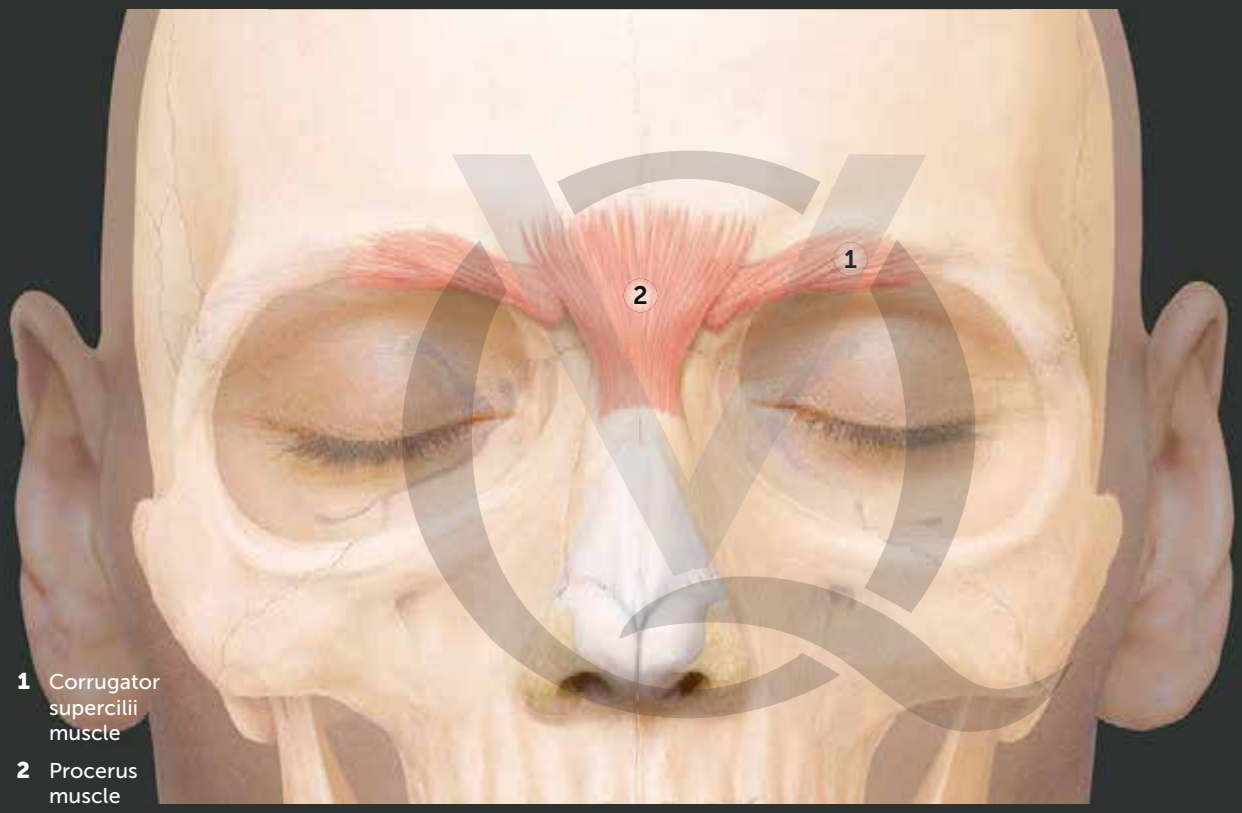


1 Frontalis muscle
2 Orbicularis oculi muscle
3 Procerus muscle
4 Dermal insertion of corrugator supercilii muscle

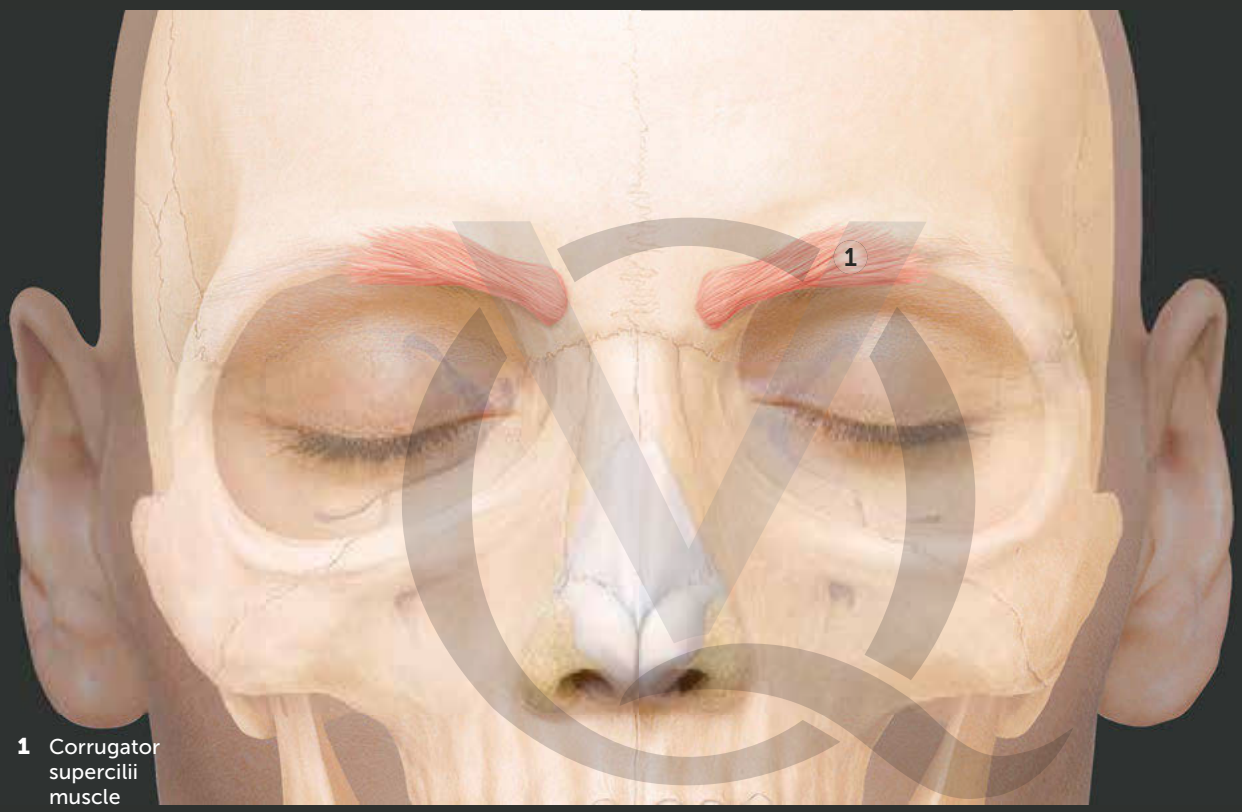
1 Frontalis muscle
2 Corrugator supercilii muscle
3 Procerus muscle

Muscles of the glabellar region (superficial view).



1 Corrugator supercilii muscle

2 Procerus muscle



1 Corrugator supercilii muscle

Muscles of the glabellar region (deep view).

Upper Face

Soft Tissue Filler Treatments:

Temples
Forehead

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Soft Tissue Filler Treatments:
Temples

The temporal region contains 10 distinct fascial layers. According to some authors, there may be a total of 13 layers, some of which can be differentiated only via histologic analyses. The 10 distinct layers are as follows:

1. Skin
2. Superficial fatty layer (arranged in compartments)
3. Superficial temporal fascia
4. Innominate fascia (cranial to the inferior temporal septum) and deep temporal fatty layer (caudal to the inferior temporal septum)
5. Superficial lamina of the deep temporal fascia
6. Superficial (intermediate/intralaminar) fat pad
7. Deep lamina of the deep temporal fascia
8. Deep temporal fat pad (temporal extension of the buccal fat pad of Bichat)
9. Temporalis muscle
10. Periosteum

The layers of the temporal region continue seamlessly with the layers of the scalp. The galea aponeurotica (layer 3 of the scalp) is continuous with the superficial temporal fascia in the temple; the latter then continues with the midfacial superficial musculoaponeurotic system (SMAS) and the platysma in the neck.

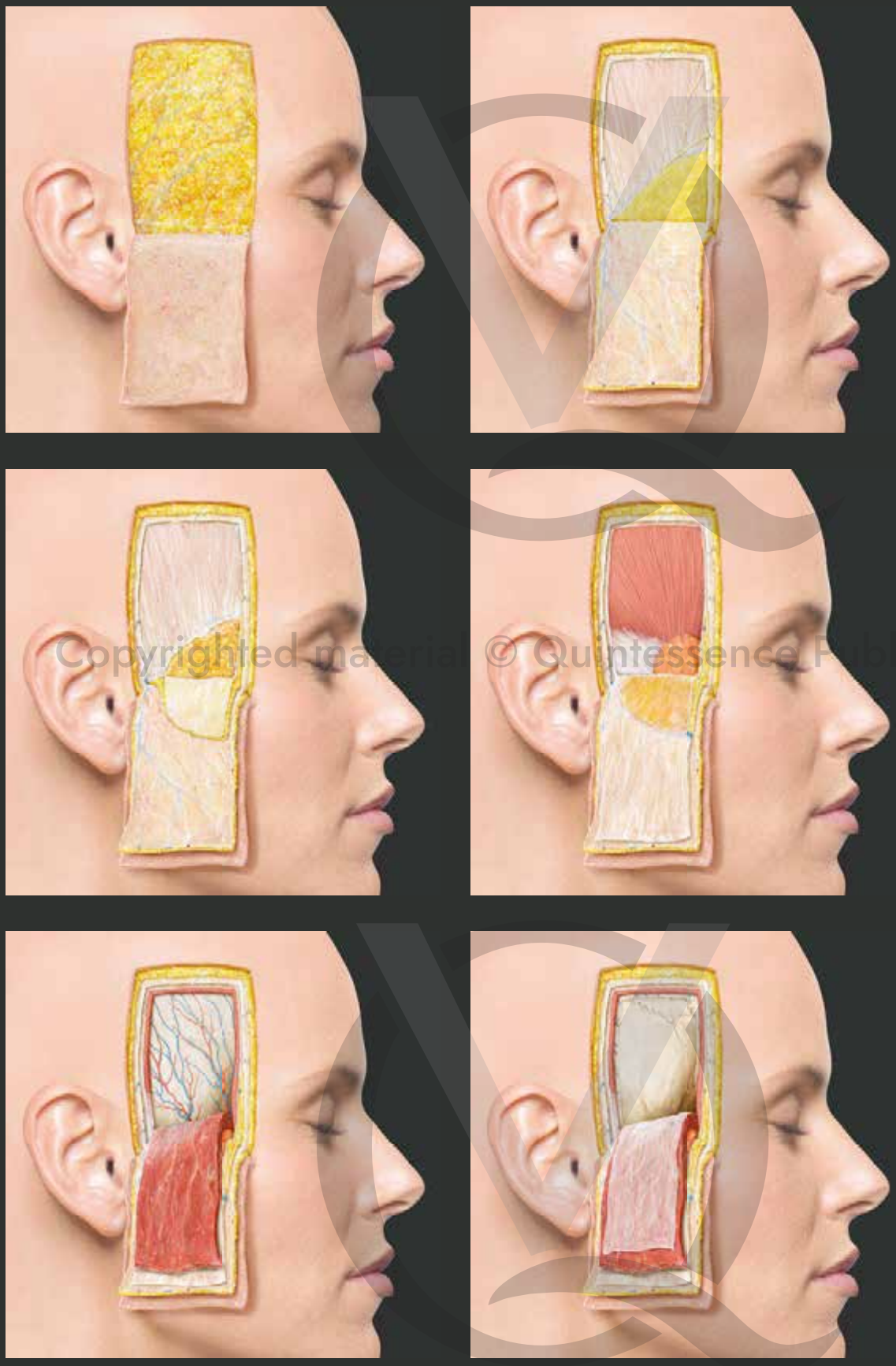
The loose (areolar) connective tissue of the scalp (layer 4) is continuous with the loose connective tissue in the upper temporal region, also referred to as the *innominate fascia*. This fascia terminates at the inferior temporal septum (sometimes called the *Pitanguy line*) and does not extend below that line. In the same plane, the deep fat of the temporal region provides protection for the frontal branches of the facial nerve as they travel from the parotid region to the forehead and glabella.

The periosteum of the scalp (layer 5) continues lateral to the temporal crest as the deep temporal fascia and splits at approximately the level of the inferior temporal septum into two laminae: a superficial lamina and a deep lamina. Between these two laminae lies the superficial temporal fat pad, which does not end at the zygomatic arch but instead continues into the medial and lateral midface. Medially, it connects to the suborbicularis oculi fat (SOOF) and to the preperiosteal fat within the prezygomatic space. Laterally, it connects to fatty extensions that reach as far as the parotid gland and the zygomaticus major muscle, and it links to the deep lateral cheek fat compartment via the interzygomatic passage.

The deep temporal fat pad is one of four extensions of the buccal fat pad of Bichat and therefore has connections to the middle and lower face. Surgical removal of the buccal fat pad can thus affect not only the volume of the middle and lower face (the primary clinical indication for its removal) but also indirectly lead to temporal hollowing.

1 Skin
2 Superficial fatty layer
3 Superficial temporal fascia
4 Auriculotemporal nerve (sensory); posterior branch of the superficial temporal artery and vein
5 Deep temporal fascia
6 Temporalis muscle
7 Posterior deep temporal artery
8 Periosteum
9 Deep fat of the temple
10 Superficial (intralaminar/ intermediate) temporal fat pad
11 Middle temporal vein
12 Zygomatico-orbital artery
13 Frontal branch(es) of the facial nerve
14 Deep temporal fat pad (temporal extension of the buccal fat pad of Bichat)

Cross sectional view of the layers of the temporal region.



Layer-by-layer reflection of the temporal fascial layers.