

“WAY”: A practical means to identify and treat the aging process

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Abstract

Background: Many patients consult a specialist in esthetics to improve certain aspects of their face that are altered by aging. To ensure optimal results and to define the best approach for such interventions, it is important that specialists have a comprehensive understanding of facial anatomy and of the aging process in the regions of interest.

Aims: The main purpose of this article was to provide a practical approach for managing aging process in the mid- and lower face. Additionally, this paper also aimed to describe the processes associated with aging that may affect the morphology and the appearance of jaw contour (“W”); prejowl (“A”); tear trough, palpebromalar area, and nasojugal groove (“Y”) (“WAY”) signs.

Methods: The Current paper combined the authors experience with the currently available scientific evidence.

Results: In this study, the anatomy and the changes associated with aging of the mandibular line and that of the tear trough, palpebromalar area, and nasojugal groove was described. The important anatomical changes in these facial regions can be considered through the “WAY” paradigm, signs of aging that can be treated through a variety of surgical and nonsurgical approaches. Although surgical procedures may obtain good results, patients generally prefer less invasive treatments, which have a good efficacy profile, but are safer and have a shorter recovery time.

Conclusions: The “WAY” signs identify anatomical changes in the mandibular line and tear trough, palpebromalar area, and nasojugal groove associated with aging that can be corrected by different procedures, preferably minimally invasive ones.

KEYWORDS

botulinumtoxin A, dermal fillers, facial aging, hyaluronic acid, nasojugal groove

1 | INTRODUCTION

The face experiences characteristic changes during aging, which affect at the different facial structures, namely the skeleton, ligaments,

muscles, adipose tissue, and skin.¹ Moreover, these changes befall each mentioned structure at different rates and degrees depending on the regions of the face and gender, starting in each individual at a different age, and differing between ethnic background.²

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Independently of the technique, facial analysis is the cornerstone of optimal outcomes. Such analysis critically depends on understanding of underlying anatomy and the clinical implications that anatomy has for facial aging.³

From a frontal viewpoint, a female face with a youthful aspect can be characterized as heart-shaped, with more volume in the middle part and less in the lower third.⁴ Similarly, the lower third of the youthful face is characterized by having a smooth transition from the cheek to the chin.⁴

Furthermore, the jaw line is well defined and it has a curved shape from the region of the mandible angle to the chin, adopting the shape of a "hockey stick" when contemplated laterally.^{4,5} The middle third of the face has a full form, rounded and with a smooth transition from the palpebral and malar region, adopting a convex shape and without any shadowing.^{4,5}

Aging process changes mean that from the lateral aspect, the "hockey stick" is converted into a "W" shape.⁵⁻⁷ In the same region, labio-mandibular grooves appear, as well as an indented zone where there is a loss of volume anterior to the jowl, called the prejowl space, plus a lateral continuation of labiomental crease in the shape of an "A".⁵⁻⁷ At the level of the midface, there is a loss of convex cheek fullness and aging provokes a series of events, such as infraorbital pseudoherniation, tear trough, and malar and jugal droop leading to the appearance of dark circles under the eyes and nasojugal grooves. Consequently, the palpebromalar region adopts a pronounced concave "Y" shape.^{1,8-10}

Several techniques are available to counteract the effects of aging and restore a youthful facial appearance, which can be divided into surgical and nonsurgical techniques.^{6-8,11-14} Minimally invasive procedures include the injection of hyaluronic acid (HA) fillers to restore volume and to improve tissue ptosis, and the application of Botulinumtoxin A (BoNTA) to avoid the muscle hypercontraction caused by aging.^{4-6,11-14} Currently, these less invasive techniques are becoming increasingly popular due to their more immediate, safer and natural effects, as well as due to the shorter recovery period that implies less interference with the patient's daily routines.^{6-8,11-15}

This article aimed to provide the processes associated with aging that may affect their morphology and the appearance of the "W", "A" and "Y" ("WAY") signs. Additionally, the current paper will assess the currently available therapies for correcting these changes in facial morphology and restoring individual's appearance, focusing on the application of minimally invasive techniques.

2 | THE "WAY" SIGNS

2.1 | Aging of the jaw contour or "W"

The mandible provides the main support to the lower part of the face. The height of the mandibular branch, the height of the mandibular body, and the projection of the mandible (which is the length of the mandibular body), all decrease with age.¹⁶⁻¹⁸ This reduces the chin projection and augments in the labio-mentalis groove.^{1,2,16-20}

Just below the mental foramen, a triangle-shaped bone defect translates superficially into the genio-mandibular groove or the so-called prejowl.^{1,2,16-21} The mandibular angle increases with age, which contributes to the loss of definition of the mandibular rim.^{1,2,16-21} Overall, there is a loss of volume that contributes to a decrease in the support provided by the soft tissues of the lower part of the face.

Aging produces changes in the lower third of the face: the labio-mandibular groove, the jowl, prejowl, and a diffusion of the mandibular angle.^{1-3,6-8,13,19,22-25}

With age, the roof of the premaseter space becomes looser, while the anterior and inferior boundaries lose firmness and their retention capacity.^{1,2,12,26-29} When added to the weakening of the mandibular septum, these changes drive the migration of the premaseter space in the caudal-medial direction, producing the jowl that becomes the first V of the W.^{1,2,12,16,26-32} The mandibular angle increases during aging due to loss of volume and a weakening of the platysma-auricular ligament, thereby creating the second V of the W.^{1,2,16-20,33-35}

2.2 | The prejowl or "A"

One of the main changes observed in the lower third of the face is ptosis of the labial commissure, which results in a triangular depressed area at the corner of the mouth, increased labio-mental sulcus, the formation of marionette lines, and decreased the concavity between the jaw and neck.^{1-8,27,36} (Figure 1).

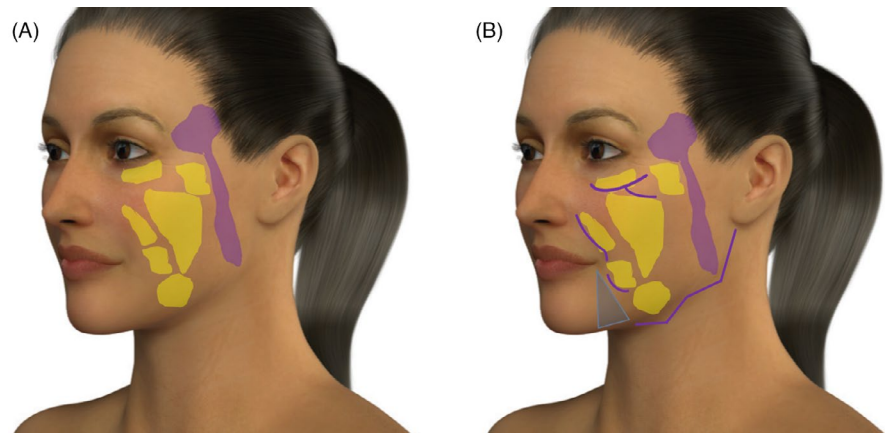
In young patients, the buccal space is at the level of the oral commissure and it is separated from the anterior part of the premaseter space.^{26,37-41} With aging, the buccal space becomes looser and causes the lower part of the Bichat ball to descend, causing the anteroinferior part of the premaseter space to bulge out.^{1-8,19,27,37,39} When a labiomental crease reaches the prejowl space, it creates the horizontal portion of the letter A.^{20,21} The prejowl makes the perception of the jowl more intense.²¹ The most medial portion of the letter A is formed by resorption of the triangular-shaped bone referred to as the prejowl and by the antagonistic action of the muscles depressor anguli oris, depressor of the lower lip, and mentalis.^{20,21} (Figure 1).

2.3 | Aging of the palpebromalar and nasojugal region or the "Y"

The periocular and malar areas generally show the first signs of aging in the face, losing their uniform round fullness and acquiring a 'Y-shape', which is defined supero medially by the tear trough ligament, superolaterally by the palpebromalar groove and inferolaterally by the nasojugal groove.^{10,12,28,36,42,43} (Figure 2).

Aging changes make a depression or concavity visible where the thin skin of the eyelid joins the thicker skin of the nose and cheek.^{10,29,37} The depression initially begins to appear medially but as aging progresses, the loss in volume may manifest laterally, becoming noticeable in the cheek area. This produces a convex contour

FIGURE 1 On the left (A), a young person with strong ligaments, well-supported facial fat, and tight spaces. With age (B), fat pad descends and loses volume. Image adapted from Mendelson et al²⁷



of the upper cheek region that flattens or becomes more concave with age.³⁰ A 2-3 cm depression also extends inferolaterally from the eyelid, forming the shape of a letter "Y", referred to through a variety of names including the nasojugal groove^{1,6,10,31} (Figure 3).

3 | ESTHETIC ANALYSIS

The objective of any esthetic treatment is to restore the proportions considered to be harmonious and that have been lost as a result of aging.^{25,34,44} As indicated above, a youthful female face has a heart shape or a base-inverted triangular shape, with more volume in the middle third that gradually decreases toward the caudal region.¹⁻⁸



FIGURE 2 Facial aging is driven by skeletal atrophy, producing a wider orbital opening in conjunction with the descent of the medial malar fat, thereby reducing malar fullness and the anterior projection, accentuating the concavity of the cheek. The images of this figure are an Allergan property and it was provided a consent for using them in this publication

4 | TECHNIQUES TO TREAT THE FACIAL CONTOUR

Esthetic treatments should be focused on patient needs and to select a specific esthetic approach according to different facial shapes.³² The most effective treatment for facial rejuvenation is that aimed at restoring volume to compensate for bone loss, as well as the lifting and repositioning the overlying soft tissues.^{18,32} One of the most common less invasive approaches that is used in medical practice to



FIGURE 3 A comparison of the aging process of the mandibular contour, prejowl, and of the orbital-malar region. A, In the young face the jaw line is well defined and it has a curved shape from the region of the mandible angle to the chin, adopting the shape of a "hockey stick" (red line). The middle third of the face has a full form, rounded and with a smooth transition from the palpebral and malar region, adopting a convex shape and without any shadowing (purple circle). B, With the age the "hockey stick" is converted into a "W" shape (red line). There is a loss of volume anterior to the jowl, called the prejowl space, plus a lateral continuation of labiomental crease in the shape of an "A" (Pink line). There is a loss of convex cheek fullness and the palpebromalar region adopting a pronounced concave "Y" shape (Purple lines)

improve facial appearance involves the use HA fillers to replace lost volume.¹⁴ The signs of aging may be more or less marked in a patient, usually depending on their age, and therefore, the treatment will vary depending on the extent of skin aging.¹⁻⁸ This treatment must be personalized, specifically aimed at treating the aging areas and proportional to the actual level of skin aging observed.^{12,32,36,44,45}

4.1 | Treatment of the “W”

When treating the mandibular contour, it is important to replace volume in the correct sequence to obtain maximum benefits from filling, following a pattern that counteracts the force of gravity.³² It is recommended that the HA should first be anchored from the upper to the lower areas (malar, parotid-preauricular and mandibular) in order to reduce the effect of pseudoptosis that aggravates the loss of mandibular definition.^{20,32}

4.1.1 | Zygomatic anchoring

Treatment should start by injecting the HA dermal filler VYC-20L (Juvéderm® Voluma; Allergan plc) onto the zygomaticotemporal suture at the supraperiosteal level in order to provide support at the lateral Zygomaticus level. If the volume needed to be applied is

0.3 mL on each side, the treatment should be divided into 3 microbolus injections delivered to sites 1 cm apart. Aspiration prior to injection is necessary and postinjection massage is advisable, always on the Zygomatic bone. Caution should be taken by the specialist to avoid the zygomatic facial artery and vein, and the fillers should be injected slowly, avoiding scratching the periosteum.

4.1.2 | Preauricular area

The preauricular area is very often the superficial area where most of the volume loss takes place and needs to be addressed systematically to recreate the oval contour of the face. In the Preauricular area, volume replacement may be achieved with a HA dermal filler, (VYC-20L). The filler is administered by using a subcutaneous injection into the temporal lateral cheek fat compartment by means of a fanning technique (Figure 4). The blunt cannula is inserted through a single insertion point and pivoted to create a series of linear tunnels in a fanlike pattern. In this area, filler injections are looking for a volumizing effect. That is why a filler with both high elastic modulus (G') and viscous modulus (G'') like VYC-20L was selected.⁴⁶ Because of the Preauricular area is prone to bruising, injectors need to be alert to avoid the transverse facial artery, facial vein, and the parotid duct. Additionally, the injector needs to be careful with the buccal

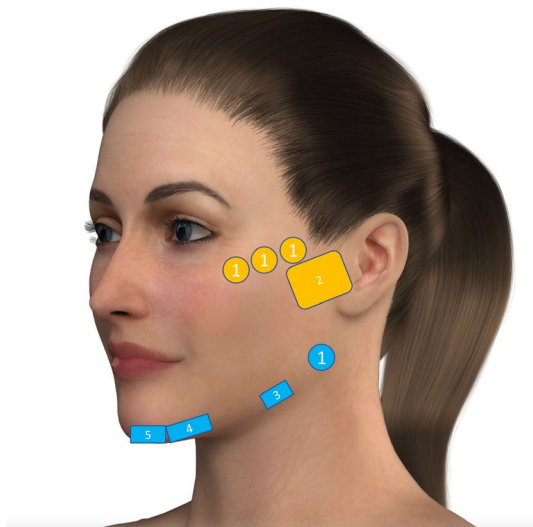


FIGURE 4 Volume replacement in the malar area can be achieved by injecting VYC-20L (Juvéderm® Voluma; Allergan plc) at three sites in the lateral cheek region (1: yellow), and in the submalar area (2: yellow). Mandible body and angle was treated with VYC-25L (Juvéderm Volux; Allergan plc) (1, 3,4, and 5 blue). These fillers are delivered by means of a superficial subcutaneous injection over the mandible body. Caution should be taken to avoid the parotid gland, the facial nerve, the transverse facial artery and the mental artery vein and nerve. Each of the points identified in this figure correspond to those defined in the MD codes.^{12,13} The image of this figure is an Allergan property and it was provided a consent for using them in this publication

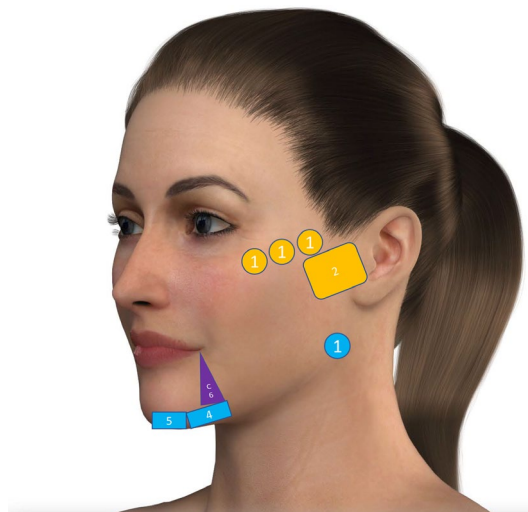


FIGURE 5 Volume replacement in the malar area can be achieved by injecting VYC-20L at three sites in the lateral cheek region (1: yellow), and in the submalar area (2: yellow). Mandible body and angle was treated with VYC-25L (1, 4, and 5 blue). These fillers are delivered by means of a superficial subcutaneous injection over the mandible body. Caution should be taken to avoid the parotid gland, the transverse facial artery and vein, and the facial nerve. Filling of the prejowl area can be achieved with VYC-25L (c6: purple) delivered using a fanning technique, taking caution to avoid the mental artery, vein and nerve. Each of the points identified in this figure correspond to those defined in the MD codes.^{12,13} The image of this figure is an Allergan property and it was provided a consent for using them in this publication



FIGURE 6 Patient with a W and an A at the Jawline before treatment (A), showing the treatment plan (B), and after treatment (C). The treatment strategy with Hyaluronic acid fillers was: Gray Circles 1 = Ck 1, (0.3 mL), using deep supraperiostium injection with a high-density filler and Ck4 (0.5 mL) for submalar area using subcutaneous injections with a high-density filler; Blue Circle 1 = Jw 1 (0.3 mL) for the mandibular angle using deep supraperiostium injection with a high-density filler, and 3 (0.2 mL) and 4 (0.3 mL) and 5 (0.2 mL) with subcutaneous injection of a very high-density filler (1 mL); Purple figures C6 (0.5 mL) for prejowl area using subcutaneous injections with a very high-density filler. The patient provided their consent for the use of their image in this publication. Each of the points identified in this figure correspond to those defined in the MD codes^{12,13}

MD codes™	Product	Target layer	Tool	Delivery	Volume (mL)	
					Right	Left
Ck1	VYC-20L	Supraperiostial	Needle	Bolus	0.1 + 0.1 + 0.1	0.1 + 0.1 + 0.1
Ck4	VYC-20L	Superficial fat pad	Cannula	Fanning	0.5	0.5
Jw1	VYC-25L	Supraperiostial	Needle	Bolus	0.3	0.3
Jw3	VYC-25L	Superficial fat pad	Cannula	Linear	0.2	0.2
Jw4	VYC-25L	Superficial fat pad	Cannula	Linear	0.3	0.3
Jw5	VYC-25L	Supraperiostial	Cannula	Linear	0.2	0.2
C6	VYC-25L	Superficial fat pad	Cannula	Fanning	0.5	0.5

branches of the facial nerve. The minimum volume to be applied is 0.5 mL on each side. This area is prone to forming irregularities. Thus, the skin surface should be massaged.

4.1.3 | Mandible body and angle

The injection of fillers in this area creates a more defined jawline contour,^{5,33} which may be achieved by injecting VYC-25L (Juvéderm® Volux; Allergan plc) at three or four sites on each side (Figure 4). When performing these injections, the specialist should palpate the area, and attention should be paid to avoid the facial artery, facial vein, and parotid gland. A subcutaneous approach is more appropriate, using a blunt cannula and injecting slowly following a linear antero-retrograde technique. The minimum volume to be applied is 1 mL on each side. The treatment area is prone to develop some hematomas.

4.2 | Treatment of the “A” or prejowl

Like the mandibular region, when treating the prejowl it is also important to replace volume in the correct sequence and to follow a pattern that counteracts the force of gravity in order to obtain the maximum benefits from filling. It is recommended that the HA should first be anchored from the upper to the lower areas (zygomatic, preauricular and mandibular) to reduce the effect of pseudoptosis that aggravates the labio-mandibular groove.^{20,32} Volume should then be added to the prejowl in order to elevate the oral commissure, to reduce the labio-mandibular grooves and to define the anterior part of the mandibular line.^{20,32}

For most specialists, the preferred volumizing are high-density HA fillers, such as VYC-25L. The addition of volume to the prejowl is the optimal treatment in patients with volume loss along the mandibular line, as long as they have a thin and slender neck. If the patient has excess fat on the neck or at the submental level, the effect of the

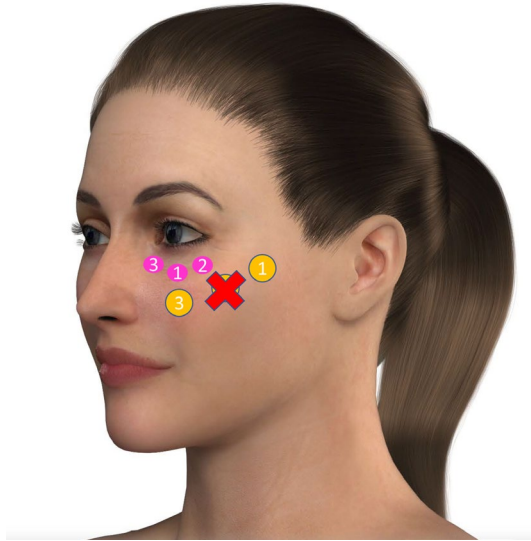


FIGURE 7 Volume replacement in the upper cheek using VYC-20L. Potential injection sites in the upper cheek include the lateral cheek (site 1) and medial cheek (site 3). Injection into the anterior cheek (red cross) must be avoided. Caution should be taken to avoid the zygomatic facial vessels and nerves in the lateral cheek, as well as the infraorbital and the angular artery and vein in the anterior and medial cheek. Filling of Tear trough area can be achieved with VYC-15L (Juvéderm Volbella; Allergan plc) (1, 2 and 3 pink) delivered using a micro bolus technique, taking caution to avoid the infraorbital artery, vein and nerve; and angular artery and vein. Each of the points identified in this figure correspond to those defined in the MD codes.^{12,13} The image of this figure is an Allergan property and it was provided a consent for using them in this publication

filling is less evident and thus, in these cases it is more appropriate to start with procedures that reduce the fat in those areas.^{20,32} To treat the prejowl with HA, the filler should be deposited subcutaneously using a blunt cannula, just below the commissure, and at the lower part of the A below the mandibular ridge^{20,32} (Figure 5). The injection should be performed in a linear antero-retrograde fashion, using a fan technique.

Injections should be made below the mandibular ridge to improve concavity^{5,32} and the filler can be injected from a lateral entry point or perpendicularly.^{20,32} Once the filler has been injected, the area should be massaged to smooth the contours. The treatment with the filler is finished when the mandibular line has become smooth, and there is a smooth transition between the jowl and chin, diffusing the A (Figure 6). It is important to bear in mind the location of the Mental artery and vein in order to avoid provoking ecchymosis or hematomas, and to prevent intravascular injection. Before injecting, aspiration should be performed as a prophylactic measure and a new needle without fillers should be used prior to injections. In patients with a predisposition to ecchymosis or hematomas, a vitamin K cream or arnica gel may be useful to speed up its resolution.⁴⁷

4.3 | Treatment of the palpebromalar and nasojugal grooves or “Y”

Volume replacement in the upper cheek can be achieved with VYC-20L at two potential injection sites: the lateral cheek and medial cheek. It is necessary to avoid injecting into the anterior cheek (yellow circle) because this may exacerbate the nasojugal fold (Figure 7). VYC-20L should be administered as needed at these sites, paying particular attention to ethnic or gender differences in terms of bone anatomy. Although the validity of the canon is intended to apply across race and gender, every ethnic group has its own esthetic characteristics, and therefore, the main objective of the esthetic treatments would be to preserve the esthetically strong points while seek to enhance “deficient” features and improve esthetic balance. Additionally, the question of whether men and women have the same perception of female physical attractiveness remains.⁴⁸ Moreover, significant differences in preferences for physical attractiveness along a gradient of socio-economic development have been also suggested.⁴⁹ Aspiration is necessary before injection at both sites and massaging after injection helps to distribute the filler evenly. VYC-20L is administered to the lateral cheek by a small supraperiosteal bolus injection. However, if 0.3 mL volume is needed on each side, the treatment should be divided into three bolus injections, taking care to avoid the zygomatic facial vessels and nerves. Injections should be made slowly at each site, exercising care to avoid scratching the periosteum.

In the anterior cheek, VYC-20L may be administered, with the patient in a sitting position, by means a blunt cannula to deep subcutaneous tissue using fan technique, or alternatively, by means of a small supraperiosteal bolus injection. The latter should be considered when there is a lack of bone projection. The minimal amount to use in this case is 0.3 mL per side, paying special attention to avoid the infraorbital artery, vein, and nerve. Indeed, injections should be made beneath the orbital rim (arcus marginalis) and lateral to the mid-pupillary line. Rather than a needle, the use of a 25G blunt microcannula is recommended if VYC-20L is injected medial to the mid-pupillary line and close to the nose. The total amount in this case is 0.5 mL per side, however, it is important to note that this is an area of risk for severe vascular damage and thus, we must stress that the use of a needle is not recommended (Figure 7).

4.4 | Lid-cheek junction

Volume replacement in the medial and lateral lid-cheek junction can be achieved using VYC-15L (Juvéderm® Volbella; Allergan plc). This product must be delivered in microaliquots and supraperiosteal deposits at two or three sites in the medial lid-cheek junction, and/or at two to three sites in the lateral lid-cheek junction (Figures 7 and 8). Injections at the lid-cheek junction should be only attempted by experienced professionals.^{12,13,32} There is a



FIGURE 8 Patient with a Y before treatment (A), the treatment plan (B), and after treatment (C). The treatment strategy involved the use of Hyaluronic acid fillers: Red Circle 1 = T1 (0.7 mL) for the temporal fossa using deep supraperiostium injections with a high-density filler; Gray Circles 1 = Ck1 (0.3 mL), 3 = Ck 3 (0.5 mL) for the malar area, deep injection with a high-density filler; Pink Circles 1, 2 and 3 = Tt1, Tt2, Tt3 (0.5 mL) for the dark circles, supraperiostium injection with a low density filler. The patient provided their consent for the use of their image in this publication. Each of the points identified in this figure correspond to those defined in the MD codes.^{12,50} Ck: cheek; Tt: tear trough, T: temporal

MD Codes™	Product	Target layer	Tool	Delivery	Volume (mL)	
					Right	Left
Ck1	VYC-20L	Supraperiostial	Needle	Bolus	0.1 + 0.1 + 0.1	0.1 + 0.1 + 0.1
Ck3	VYC-20L	Deep malar fat pad	Cannula	Fanning	0.5	0.5
T1	VYC-20L	Supraperiostial	Needle	Bolus	0.7	0.7
Tt1	VYC-15L	Supraperiostial	Cannula	Micro-aliquot	0.2	0.2
Tt2	VYC-15L	Supraperiostial	Cannula	Micro-aliquot	0.2	0.2
Tt3	VYC-15L	Supraperiostial	Cannula	Micro-aliquot	0.1	0.1

high risk of bruising in this area and the injections carry significant risk of persistent eyelid edema, embolization, asymmetry, lumps and double vision.^{32,44} The use of a 25G blunt microcannula may avoid bruising and embolization.

In these cases, the orbit should be avoided by performing injections 1-2 mm below the orbital rim. The patient should close their eyes for protection during the treatment, injecting slowly and remaining deep along the inferior orbital rim, and massaging after treatment. Overcorrection should be avoided and caution should be taken to avoid the infraorbital nerve, artery and vein at site 1, and the angular artery and vein when injecting at site 3.

5 | CONCLUSIONS

Facial aging occurs at different levels, including bone, ligaments, muscles, adipose tissue, and skin. Among the different aging changes, there is a significant volume loss of the deeper tissue layers,

with deflation and descent of depleted subcutaneous fat compartments and loss of bone.

At the malar and mandibular, there are changes in the jawline, which loses its characteristic hockey stick shape, and it adopts a more marked "W" shape.

Another sign that appears with aging is the prejowl or "A", a depression anterior to the jowl and secondary to the mandibular bone resorption that occurs at that level.

Additionally, the effects of aging on the medial part of the infra-orbital region provoke the formation of a "Y" shape that is defined superolaterally by the palpebromalar groove and inferolaterally by the nasojugal groove.

Once the processes that alter the normal facial anatomy are understood, the esthetic morphology of the affected area can be restored with greater guarantees. A variety of less invasive treatments are now available to achieve this, such as the use of fillers (eg, HA) or through the use of botulinumtoxin type A to relax the depressor muscle of the oral commissure and the mentalis muscle, thereby

restoring a more youthful morphology. Due to the growing number of esthetic procedures, specialists have many different options to address facial aging. Nevertheless, changes to individual structures should be made with a mindful approach to improving overall facial harmony.

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CONFLICT OF INTEREST

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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