The Facial Platysma and Its Underappreciated Role in Lower Face Dynamics and Contour

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BACKGROUND The platysma is a superficial muscle involved in important features of the aging neck. Vertical bands, horizontal lines, and loss of lower face contour are effectively treated with botulinum toxin A (BoNT-A). However, its pars facialis, mandibularis, and modiolaris have been underappreciated.

OBJECTIVE To demonstrate the role of BoNT-A treatment of the upper platysma and its impact on lower face dynamics and contour.

MATERIAL AND METHODS Retrospective analysis of cases treated by an injection pattern encompassing the facial platysma components, aiming to block the lower face as a whole complex. It consisted of 2 intramuscular injections into the mentalis muscle and 2 horizontal lines of BoNT-A injections superficially performed above and below the mandible (total dose, 16 onabotulinumtoxinA U/side). Photographs were taken at rest and during motion (frontal and oblique views), before and after treatment.

RESULTS A total of 161 patients have been treated in the last 2 years with the following results: frontal and lateral enhancement of lower facial contour, relaxation of high horizontal lines located just below the lateral mandibular border, and lower deep vertical smile lines present lateral to the oral commissures and melolmental folds.

CONCLUSION The upper platysma muscle plays a relevant role in the functional anatomy of the lower face that can be modulated safely with neuromodulators.

A.R.T. de Almeida has been a consultant to Allergan Inc. and Merz, and participated in clinical trials for Allergan and Galderma. A. Romiti has been paid to give lectures for Galderma. J.D.A. Carruthers has been paid to do research by Allergan, Inc., Medicis, Inc., Ipsen Pharma, Merz GmbH, and has been a consultant to Allergan, Inc., Medicis, Inc., Ipsen Pharma, Merz GmbH, and Solstice Neurosciences.

The muscular anatomy involved in the lower face muscles of facial expression is complex and includes the orbicularis oris (OO), depressor angulis oris (DAO), depressor labii inferioris (DLI), risorius (R), masseter (MA), mentalis (M), and platysma (P) muscles. It is known that not only persistent contractions wrinkle the skin, but the increased platysmal resting tone is also implicated in the muscular role of senescence.1 Such changes can be modified by neuromodulators, either alone or in combination with other treatment modalities (e.g., fillers, resurfacing with laser and energy-based devices, surgery).

The use of botulinum toxin A (BoNT-A) in this region is considered as an advanced technique and gained acceptance after years of experience in the upper face. As with the upper facial areas, it can be indicated for the treatment of specific muscles alone or several muscles combined as a whole lower face complex. Usually, to address mouth frown and melolmental folds (Marionette Lines), the depressor anguli oris is injected. Mentalis is the target when correcting or alleviating a mental crease and/or a peau d’orange appearance over the chin,2 whereas injections into the MA can alter the shape of the jawline by reducing muscle thickness and bulk.3

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The platysma is a broad flat muscle that covers the anterior and lateral aspects of the neck. It rises from the superficial fascia over the upper chest and ascends superior-medially from the neck to insert into 3 points: medially into the mentum; centrally into the periosteum of the ramus of the mandible; and laterally to the OO, DAO, and R muscles overlying subcutaneous tissue. Its anterior fibers from both sides may cross each other at the midline, forming various patterns of decussation, whereas complete separation may also occur. When the upper and lower portions of the platysma contract, they pull the skin to the center of the muscle like a compressed accordion, forming horizontal neck lines.

Most BoNT-A injection techniques have targeted the platysmal bands and horizontal necklines (like “laces”). First described by Brandt and Bellman, not only the tightening of the neck, but also some kind of jawline recontouring was noticed by these authors. To achieve the results, though, high doses of BoNT-As were needed (up to 200 units of onabotulinumtoxinA), and side effects related to the toxin diffusion to adjacent muscles were also reported. This fact made experts recommend reducing the total dosage used, to avoid complications.

Focusing specifically on jawline redefinition, Levy described the “Nefertiti lift,” where individuals were horizontally injected along each mandible and into the upper portion of the posterior platysmal band. The result was a visible release of the platysma muscle’s downward pulling and jawline recontouring.

On the other hand, whereas useful when adequately indicated, the Nefertiti Lift technique does not address the anterior platysma fibers. Because only the lateral upper half and the posterior platysma band are treated, the untreated anterior fibers may be recruited during neck contraction, resulting in local wrinkling, banding worsening, and loss of anterior facial contour. To avoid these problems, many BoNT-A experts use their own technical variations of the method, adapted to each patient’s individual needs.

Some described techniques are a single injection sequence performed horizontally at 3 to 4 sites at the mandibular line (Dr. A. Romiti, MD, personal communication, June 6, 2013), a technique using a single injection site with 20U to 30U onabotulinumtoxinA per side, or an entire neck treatment of minute intradermal doses of BoNT-A, with a total dose of 60 to 80 onabotulinumtoxinA U (Dr. Woffles Wu Microbotox technique).

The objective of this article is to review the functional anatomy and to evaluate the role of BoNT-A...
treatment of the upper platysma muscle and its impact on the lower facial dynamics and contour.

**Upper Platysma Functional Anatomy**

Although appearing in face and neck drawings in anatomic papers, especially about botulinum toxin, the upper platysma location and function are frequently neglected or forgotten. It is classically described as having 3 parts:

Platysma pars mandibularis, which inserts onto the lower border of mandible and onto the skin and subcutaneous plane of the lower face, with some fibers interdigitating with the DAO. Its contraction forms oblique and horizontal parallel lines and wrinkles that appear high in the neck just below the lateral mandibular border and above the necklace lines (Figure 1).

Platysma pars labialis, which travels deep to DAO, re-emerges medially to it, interdigitates and blends to OO, DLI, and mentalis muscles, and in some cases, occupies the space between DLI and DAO. Its contraction may be related to horizontal lines located below the oral commissures and lower lip (Figure 2).

Platysma pars modiolaris, which includes all of the remaining fibers of upper platysma that are posterolateral to the DAO. Its contraction contributes to the appearance of lower vertical deep smile lines located laterally to the oral commissures and laterally to the melomental folds.¹⁵ (Figure 3).

**Material and Methods**

**Study Design**

This is a retrospective, open label study performed at 3 centers, which complied with the ethical rules of the 2000 Declaration of Helsinki. To achieve complete relaxation of the upper platysma area, the entire lower face was considered as a single region and treated as a “lower face complex.” For this reason, a standard injection pattern was chosen and applied for all subjects.

**Patient Selection and Documentation**

Patients aged 18 years and older, seen at the Dermatologic Clinic of Hospital do Servidor Público Municipal de São Paulo and the private clinics of the first 2 authors, were selected. Subjects were invited to participate if they had investigator identified, loss of lower face contour, and/or lower face and upper neck wrinkles and lines, during lower face animation. Upper neck was defined as the region located just below the mandibular border. There were no

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Figure 2. Cadaver dissection showing the depressor angulis oris, depressor labii inferioris, platysma pars labialis, and its intimate relationship (left). Contraction of pars labialis may be related to horizontal lines located below the oral commissures and inferior lip (right).
restrictions regarding sex or cutaneous phototype. Patients were ineligible if they had received neuromodulator treatments in the preceding 120 days or if they were planning in the upcoming month to have any procedure to improve lower face contour, including fillers, chemical lipolysis injections, and energy-based devices and/or surgeries. Interested patients provided written informed consent.

Photographs were taken at rest, during full smile, and while contracting the lower face (upon request to say “eeeeee”) in frontal and oblique views before injection and after treatment, scheduled to occur after at least 15 and no more than 30 days, keeping the same camera, lighting, and distance parameters.

Patients were instructed to report any side effects, heaviness sensation, or asymmetries that might occur. The photograph pairs were evaluated by the injecting physician and the treated subject only at the follow-up visit, after 2 to 4 weeks. The analysis was standardized as follows: For each photograph pair, improvement of lower face contour was observed and compared. For efficacy measures, subjects were asked if, during animation, the lower face contour appeared more defined in lateral view (yes or no) and/or changed (more linear/triangular than round, irregular) in frontal view. Treated subjects were also asked if they were satisfied and willing to repeat the treatment (yes or no). At that moment, touch-ups could be performed if needed.

**Treatment Technique**

Botulinum toxin A vials were reconstituted as follows: 2 mL of normal saline solution were added to 100U vials (Botox/Xeomin) for a final concentration of 50 U/mL, whereas 3.2 mL were added to 500U Dysport vials to reach a ratio of 1:3 with the other neuromodulators.

To treat the lower face as a whole unit, 2 sites of the mentalis muscle were intramuscularly injected, followed by superficial BoNT-A injections in a pattern consisting of 2 horizontal lines in each side of the lower face. The first one was injected into 3 injection sites with 2U each, at the mandibular border, starting at the DAO level and spaced every 2 cm laterally, ending at the mandibular angle. The second horizontal line was placed 2 cm below the mandibular border, starting at a site below and between the mentalis and DAO muscles, spaced every 2 cm, running laterally to a point after the mandibular angle, laying between the above ones (Figure 4).

This second line was treated with 2U each into 4 injection sites. The first 2 sites might be injected with higher doses (2.5U–3U) in selected individuals who show a stronger platysmal band for a total dosage of 14U to 18U BoNT-A per side. Every injected site was compressed for a few minutes right after withdrawing the needle to reduce the likelihood of bruising.

**Results**

A total of 161 patients, both men and women, were included. Table 1 shows detailed demographic patient...
characteristics. Most individuals received 16U per side (including 2U into the mentalis muscle).

When comparing before and after photographs during animation, the effects could be observed in all patients at the follow-up visit. Physicians and subjects were all satisfied with the treatment, and patients confirmed the will to repeat the technique in the future.

Three findings showing improvement could be observed. The first sign was enhancement of lower facial contour, particularly during lower facial muscular contraction. The skin under the mandibular border seemed more closely apposed to the bone structure, and this effect could be noticed in lateral and in frontal views. Previously loose skin and the round shape of the lower face were replaced by a more linear (in some subjects, more triangular) and better defined contour. Some patients reported that their face looked “thinner” in frontal view as if they had lost weight (Figure 5).

The second finding was relaxation, and in some cases, complete disappearance of several oblique and horizontal parallel lines and wrinkles, which were seen just below the lateral mandibular border during platysmal contraction. In some patients, these wrinkles may reach the lower face and are difficult to treat (Figure 6).

The third and most surprising effect was relaxation, and in some cases, effacement of the lower vertical deep smiles lines, located just behind the oral commissures (Figures 5 and 6).

Since improvement of lower face contour, and not effacement of rhytides, was the purpose of our study, comparative facial wrinkles scales were not included in the evaluation.

Regarding adverse effects, 1 patient described a heaviness sensation after treatment, while in 2 others, a very mild unilateral reduction in the lower lip retraction was observed, probably because of slight weakness of the DLI. However, the latter was not perceived by the patients and did not require any correction. No complaints of dysphagia or voice alteration were noted.

Discussion

The full role of the upper platysma muscle in the lower face is still poorly understood and explored. Nevertheless, attentive observation may show that it can be very active in some patients, particularly with senescence.

Although Benedetto described in detail its anatomic boundaries, the consequences of its contraction on the skin is still a complex issue because of its intimate relationship, interdigitation, and blending with other

<table>
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<th>TABLE 1. Demographic Characteristics of Treated Subjects</th>
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<tr>
<td><strong>Age</strong></td>
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<td>Range 28–73</td>
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<td>Mean 56.5</td>
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<td>Female 142</td>
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<td>Male 19</td>
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<td><strong>Botulinum toxin A</strong></td>
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<td>OnabotulinumtoxinA 131</td>
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<td>AbobotulinumtoxinA 11</td>
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<td><strong>Dose/side</strong></td>
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<td>Mentalis (M)/platysma 2U/14U</td>
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lower facial muscles. During contraction, muscles follow force vectors that generally run from their insertion (mobile portion of the muscle) to their origin (fixed portion of the muscle), determining hyperkinetic lines perpendicular to the contraction’s direction and resulting in horizontal, vertical, and/or oblique wrinkles. Therefore, the horizontal lines that appear below the mandible and the chin may be secondary to the contraction of the pars mandibularis of the upper platysma, since it inserts onto the lower border of the mandible as well as in the skin and subcutaneous plane of the lower face, with some fibers interdigitating with DAO (Figure 1).

On the other hand, as the pars labialis is considered a direct labial depressor, interdigitating and blending with DAO, OO, DLI and Mentalis, its contraction may be related to the appearance of horizontal lines in the lower face—below the oral commissures—that can be identifiable even in young individuals (Figure 2).

And last, but not less important, the upper platysma pars modiolaris is frequently forgotten in the facial motion. It includes all the remaining fibers of the facial platysma that are posterolateral to the DAO. Contraction of these horizontally oriented fibers pulls the corner of the mouth laterally, thereby forming vertical lines and wrinkles located behind the DAO. In some patients, it has considerable dermal insertions lateral to the modiolus parallel to the NLF. In these cases, a smile or grimace produces lateral creases in the skin, which may be difficult to treat (Figure 3).

Figure 5. Fifty-year-old lady before and after the facial platysma botulinum toxin A treatment in oblique (left) and frontal views (right). Note the sharper, better defined lower facial contour with a more linear shape and effacement of lower face wrinkles (red circle).

Figure 6. Thirty-eight-year-old male patient. Before (above) and after upper platysma botulinum toxin A treatment (below). Note the amelioration of oblique and horizontal parallel lines located below the lateral mandibular border and lower face deep vertical smile lines (red circle).
The idea is that the upper platysma region behaves like a whole unit and has a diverse function than its lower part. Because it is a very superficial muscle, deep BoNT-A injections are not recommended, to avoid affecting underlying muscles of deglutition and causing dysphagia and voice alterations.\textsuperscript{17} The described technique, using superficial horizontal injections, aims to relax its entire width, leaving fewer areas without treatment when compared with the technique where only the vertical bands were addressed. It will allow for laterally enhancing the lower facial contour and frontal views at rest and during motion. Here, it differs from the Nefertiti lift because the Nefertiti lift technique addresses only the posterior fibers of the upper platysma, but not its anterior portion at the cervicomental junction, improving the mandibular contour mostly in lateral views.

The botulinum toxin denervation of the anterior portion of the platysma muscle, though, can produce a gentle anterior neck lift.\textsuperscript{2} Some individuals treated by the new technique, even when noticing the enhancement of the lateral mandibular contour, reported that their lower face looked thinner in frontal view. Moreover, amelioration of horizontal wrinkles located at and below the mandibular line and chin was also observed. The same effect could be noticed with deep vertical smile lines that arose near the mandibular border.

Most patients received concomitant BoNT-A treatment in the upper face. In the lower face, the total dose, including into the mentalis muscle, was lower than 20U per side, with most patients being treated with only 16U per side. For this reason, no sensations of heaviness during motion of the lower face were observed, and patient satisfaction was very high.

However, BoNT-A injection into the platysma that is too high up on the neck can result in lip asymmetries by virtue of its complex interactions with lower face muscles already described, especially with DLI.\textsuperscript{17} This is why Levy\textsuperscript{12} suggests avoiding injections anterior to a line drawn from the nasolabial fold down to the mandible. Careful observation of the functional anatomy will provide better assessment of patients’ needs. In the technique described here, lower doses are preferable for the mentalis and DAO corresponding locations as well as for all sites of the first line, located at the mandibular border. If necessary (a strong platysmal band in one side), higher amounts of BoNT-A can be placed below the mandible in the first 2 sites of the second injection line, to prevent or minimize lip asymmetries or reduction in the extent of the smile due to diffusion to R muscle (Risorius smile). Although not observed in the authors’ cases, recruitment of lower platysma fibers may occur. If necessary, it can be corrected at the follow-up visit after 2 to 4 weeks, with additional BoNT-A doses to the corresponding location.

Limitations of this study are its retrospective nature, the lack of comparative facial wrinkles scales before and after treatment that could estimate more accurately the impact on deep smile lines and submandibular lines, and the combined blockage of some lower face muscles such as DAO and mentalis. A prospective trial in the near future may be useful for this purpose.

The upper platysma muscle plays a relevant role in the functional anatomy of the lower face, acting as a major depressor that can be modulated by neuromodulators. When addressed in combination with other lower facial muscles as a whole complex, enhancement of lower facial contour and relaxation of dynamic wrinkles of the lower face will be achieved.

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\textbf{References}


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