

## REVIEW ARTICLE

# Aesthetic implications of depressor supercilii muscle block with botulinum toxin type A

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## Abstract

**Introduction:** When applying botulinum toxin in the upper third of the face, it is important to consider the balance between the elevator and depressor muscles of the eyebrows. Depressor supercilii muscle block leads to elevation of the medial portion of the eyebrow and correction of the oblique lines in the frown.

**Objectives:** The intention is to highlight the importance of the depressor supercilii muscle block as a useful tool to reposition the medial portion of the eyebrow.

**Patients and methods:** Three cases are presented, in whom botulinum toxin is applied conventionally and subsequently on the depressor supercilii muscle after the subjective sensation of flattening of the glabella and increasing distance between the eyebrows referred by the patients.

**Results:** The application of botulinum toxin type A on the depressor supercilii muscle is an effective measure to facilitate the elevation of the medial portion of the eyebrow, after the conventional application in between the eyebrows treating the orbicularis, corrugator, and procerus muscles.

**Conclusions:** Depressor supercilii muscle block can be considered when applying botulinum toxin type A in the upper third of the face, in cases where there is loss of facial aesthetic harmony. This is given by the subjective perspective of the patient due to a change in the natural expression of their face with a sensation of flattening of the glabella and distancing of the medial portion of the eyebrows, occurring after the use of a conventional technique at that anatomical level, where patients may report a “feline” or “avatar” appearance.

## KEYWORDS

botulinum toxin type A, glabella, superciliary depressor, upper third

## 1 | INTRODUCTION

Botulinum toxin type A is derived from several strains of the bacterium *Clostridium botulinum* and is a very safe non-surgical cosmetic tool for the treatment and prophylaxis of facial wrinkles due to muscle contraction by inhibiting the release of acetylcholine and generating a relaxing effect in the muscle for a period of 14–16 weeks. Additionally, it is very useful for modifying the shape and positioning of the eyebrows.<sup>1,2</sup> The procedure is minimally invasive, and the

results are optimal if the toxin is applied correctly under the precepts of aesthetics, technique, and facial anatomy.<sup>2</sup>

For the application of botulinum toxin type A on the upper third of the face, it is important to consider the balance between the elevator and depressor muscles of the eyebrows, the frontalis muscle being the main elevator and generator of the horizontal lines of the forehead, as well as the muscles of the glabellar complex and the orbital portion of orbicularis oculi which depress the eyebrows and cause frown lines.<sup>3</sup>

The depressor supercillii muscle corresponds to one of the glabellar muscles. It has its bony origin in the frontal process of the maxilla 1 centimeter superior to the medial canthal ligament and has 1–2 heads that insert in the skin located below the medial portion of the eyebrow, about 14–15 mm superior to the medial canthal tendon.<sup>4,5</sup>

Its function is synergistic at its insertion point alongside the medial portion of the orbicularis oculi muscle and the oblique portion of the corrugator supercillii muscle, generating retraction of the medial portion of the eyebrow toward the lower pole.<sup>5,6</sup> Additionally, the depressor supercillii muscle has been shown to contribute to the formation of oblique frown lines along with the procerus muscle and the medial portion of the orbicularis oculi muscle.<sup>5,7</sup>

For an adequate block of the depressor supercillii muscle, a subcutaneous injection is made 10–15 mm over the medial canthal tendon, so that it can generate the desired scope and effect, which is to achieve elevation of the medial portion of the eyebrow to correct ptosis or reduce oblique glabellar wrinkles.<sup>3,5</sup> Based on the report of 3 cases, this article will review the usefulness of depressor supercillii muscle block as a mechanism for raising the eyebrow, after multiple applications of botulinum toxin using a conventional technique and a new complain associated with the sensation of flattening of the eyebrows.

## 2 | PATIENTS AND METHODS

The following is a descriptive observational study of the case report type describing the correction of oblique frown lines and the subjective sensation of flattening of the glabella and distancing of the eyebrows after the application of botulinum toxin on the depressor supercillii muscle. A narrative literature review was carried out using the combination of the terms<sup>1</sup>: depressor supercillii and<sup>2</sup> botulinum toxin. The databases used in the research were as follows: LILACS, EMBASE, Medline, Web of Science, Google Scholar, and Scopus.

### 2.1 | Case 1

A 57-year-old male patient (Figure 1A), user of botulinum toxin and intradermal fillers since 2013. After cleaning the area with saline solution and reconstituting botulinum toxin (Botox<sup>®</sup>) in preservative-free

saline, we proceed to apply a total of 59 units distributed in the upper third of the face between the frontalis muscles (12 U), procerus (5 U), corrugator supercillii muscle (6 U in each head and 5 U in each tail), and the orbicularis oculi (10 U in each) (Figure 1B). Touch-ups are performed a month later with a new application in the frontalis muscle and the left middle corrugator. During the follow-up, the patient reports a perception of change in the natural appearance of his glabella and the expressiveness of his face. The patient described a sensation of flattening of the glabella, with a "feline" appearance, for which correction is made by blocking of the superciliary depressor using 2 units in each muscle and 4 units between the frontalis muscle and the left corrugator in its medial portion (Figure 1C). With a total of 67 units, the desired effect was achieved and a reduction of the flared appearance of the skin of the nasal bridge was achieved.

### 2.2 | Case 2

A 55-year-old female patient (Figure 2A) with no significant family or personal history and botulinum toxin user since 2012. She comes in for a new application of botulinum toxin (Botox<sup>®</sup>) in the upper third, for which a total of 60 units are used distributed between the frontal muscles (12 U), procerus (4 U), corrugator supercillii muscle (4 U in each head and 4 U in each tail), and orbicularis oculi (12 U in each orbicular) (Figure 2B). In the control, the patient reported feeling distance between her eyebrows, for which the correction was made by blocking the depressor supercillii using a total of 2 units in each muscle (Figure 1C), showing thinning over the nasal bridge.

### 2.3 | Case 3

A 55-year-old female patient (Figure 3A) with no significant family or personal history and user of botulinum toxin since 2007. She comes in for a new application of botulinum toxin (Botox<sup>®</sup>) for which a total of 52 units are used and distributed between the upper third, depressor anguli oris muscle, and the chin (Figure 3B). During the follow-up, the patient reported a widened nasal bridge, for which the correction was made by blocking the depressor supercillii using a total of 2 units in each muscle (Figure 3C).

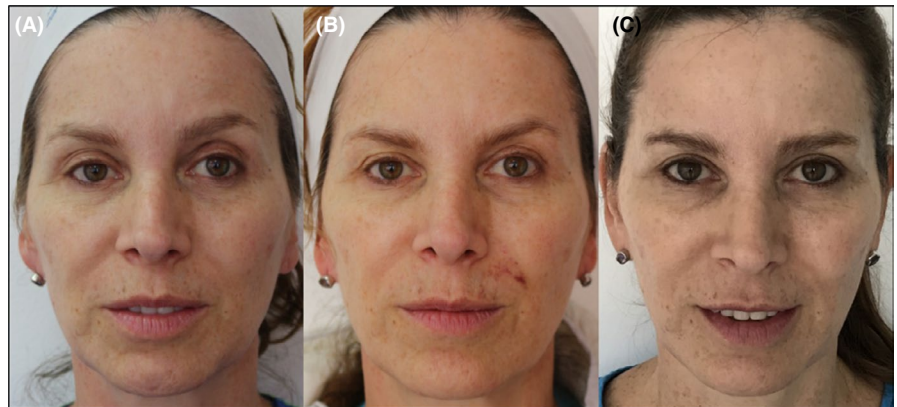


**FIGURE 1** (A) Photograph prior to application of botulinum toxin in the upper third. (B) Result after blocking the frontalis, procerus, corrugator superciliary, and orbicularis oculi muscles. (C) Correction by blocking the depressor supercillii muscle

**FIGURE 2** (A) Photograph prior to application of botulinum toxin in the upper third. (B) Result after blocking the frontalis, procerus, corrugator superciliary, and orbicularis oculi muscles. (C) Correction by blocking the depressor supercillii muscle



**FIGURE 3** (A) Photograph prior to application of botulinum toxin in the upper third. (B) Result after blocking the frontalis, procerus, corrugator superciliary, and orbicularis oculi muscles. (C) Correction by blocking the superciliary muscle



### 3 | DISCUSSION

Although the anatomy of the depressor supercillii muscle (Figure 4) (DSM) is not unanimous among anatomists and has been the cause of controversy and confusion among authors, it was described in detail by Cook et al., who demonstrated that, histologically, neurovascular fibers and structures of this muscle are independent of those of the medial portion of the orbicularis oculi muscle and the fibers of the transverse portion of the corrugator supercillii muscle.<sup>5,8</sup>

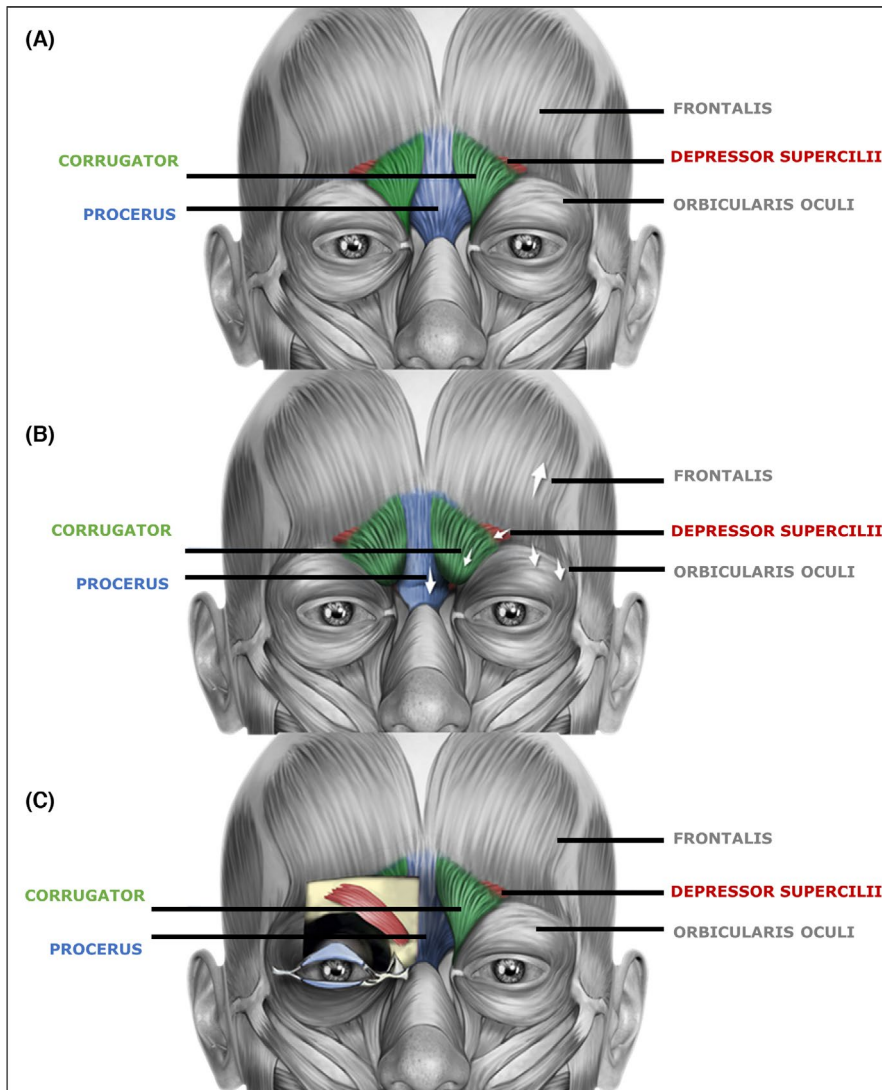
The DSM has its bony origin in the frontal process of the maxilla 1 centimeter superior to the medial canthal ligament and contributes to the formation of oblique frown lines alongside the procerus muscle and the medial head of the orbicularis oculi muscle.<sup>4,5,7</sup> Furthermore, hyperkinesia of DSM, procerus, and corrugators produce asymmetrical ptosis of the eyebrows and glabella creases, and in some cases, hyperkinesia of DSM alone causes unilateral eyebrow depression, as depicted by Muhlbauer and Holm.<sup>9</sup>

From a cosmetic point of view, ideal shape of the eyebrows in men has been described as is more horizontal on the orbital rim compared to that of women, which, for greater aesthetics, should generate an arch over the orbital rim, with elevation of the lateral tail of the eyebrow.<sup>2,10</sup> The surgical approach at this anatomical level has shown results for the improvement of ptosis, redundant palpebral skin, and glabellar wrinkles is the avulsion of the depressor muscles of the eyebrow (depressor supercillii, oblique and transverse portion of the corrugator, and medial portion of the orbicularis oculi).<sup>11</sup>

Now, for the cosmetic treatment of the glabellar region, the global aesthetic consensus for botulinum toxin type A recommends the application of 12–40 units in a total of 3–7 injection sites, emphasizing the sustained effect with the use of 20 units only.<sup>12</sup> Injection has been reported to be most effective when applied in two planes, both superficial and deep, so that it follows the anatomical paths of the depressor and corrugator supercillii muscles.<sup>13,14</sup> For the specific case of the depressor supercillii muscle, the injection should ideally be performed 10–15 mm subcutaneously over the medial canthal tendon to achieve adequate block.<sup>5</sup> The One21 technique suggests a dose of 1–2 units depending on to the mass and strength of the muscle.<sup>15</sup>

In the present study, depressor supercillii muscle block was performed in 3 patients, who showed satisfactory results for several years, until recent follow-ups in which they noticed changes in the natural expression of their face, with a subjective sensation of flattening of the glabellar area, distancing between the eyebrows and a "feline" look to their appearance. Correction by blocking this muscle made it possible to achieve an elevation of the brow in all its portions simultaneously and completely, with a shortening of the interciliary space at the level of the nasal bridge.

The usefulness of the application of 2 units of toxin on DSM has been reported in the context of patients with inverse omega-type glabellar contraction dynamics (strong contraction of the procerus, depressor supercillii, and elevator labii superioris alaeque nasi muscle),<sup>16</sup> where an oblique wrinkle is formed at the base of the medial portion of the eyebrow or in the context of marked hypertrophy of



**FIGURE 4** (A) Anatomy of the muscles of the upper third of the face. (B) Direction of contraction movement generated by the muscles of the upper third of the face. (C) Anatomy of the depressor supercilii muscle. Source: illustration owned by the author

this muscle when this area is contracted. Likewise, patients with a low position in the medial portion of the eyebrow benefit from the blocking this muscle; however, care is advised in the technique so as not to generate over elevation of this anatomical region, generating a “surprised” appearance.<sup>17</sup>

Regarding eyebrow muscle activity over the years, Yun et al. evaluated the activity of frontalis, corrugator supercilii, and the orbicularis oculi muscles using electromyography in a group of two cohorts (young group and old group). The study concluded that, as people age, there is a shift in the shape and position of the eyebrows due to an increase of the activity of depressor muscles.<sup>18</sup> Nevertheless, a limitation was that the depressor supercilii muscle activity was not assessed.

It is important to bear in mind that different muscle patterns or anatomical variations could lead to unexpected results.<sup>19</sup> Regarding the cases presented in this article, the possibility that, by repeatedly relaxing the main depressor muscles of the eyebrows (corrugator supercilii and procerus muscles), activation and hypertrophy of untreated secondary muscles are generated, such as the supercilii depressor, which did not initially play a leading role, but with the passing of time could generate alteration of facial harmony by not

blocking its fibers. In the same way, the role that the DSM plays as an individual muscle is highlighted, since even though it intermingles with fibers of the corrugator supercilii muscle and the orbicularis oculi muscle, its role is clearly evidenced at the time of blocking the action of its fibers on the medial portion of the eyebrow.

## 4 | CONCLUSION

The muscular block of the depressor supercilii can be considered in the application of botulinum toxin type A in the upper third by generating elevation of the medial portion of the eyebrow in those cases where there is loss of facial aesthetic harmony, given by the flattening of the glabella and the distancing of the medial tail of the eyebrows after the performance of the conventional technique at that anatomical level. It is important to consider its treatment in patients with oblique wrinkles at the time of contracting the eyebrows, with noted marking or evidence of hypertrophy of the muscular body in the superior medial orbital portion where this muscle is located.



**CONFLICT OF INTEREST**

Dr. Angélica Domínguez has been a Speaker for Allergan Laboratories for 10 years.

**ETHICAL APPROVAL**

All patients provided their written informed consent for the use of their images in this publication. Approval by ethics committees was not required given the nature of the article.

**DATA AVAILABILITY STATEMENT**

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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