

# Botulinum Toxin Treatment for Mild to Moderate Platysma Bands: A Systematic Review of Efficacy, Safety, and Injection Technique

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## Abstract

**Background:** Platysma bands are characteristic of an aging neck. Resection and plication of the platysma muscle is the basis of treatment. However, unfavorable surgical outcomes and improved understanding of platysma band etiology have shifted treatment towards nonsurgical rejuvenation.

**Objectives:** The aim of this paper was to assess the efficacy, injection techniques, and complications associated with botulinum toxin injection for the treatment of platysma bands.

**Methods:** A systematic literature search was performed to identify articles reporting botulinum toxin injections for platysma bands in neck rejuvenation. The search included published articles in three electronic databases—Ovid MEDLINE, EMBASE, and the Cochrane Library—between January 1985 and December 2017.

**Results:** Three studies met the inclusion criteria, with a total of 78 patients undergoing botulinum toxin injection for platysma bands. Incobotulinumtoxin A was used in 62.3% ( $n = 45/78$ ) of patients, with 38.4% ( $n = 30/78$ ) receiving abobotulinumtoxin A. Efficacy was assessed using the Merz platysma score scale. A mean score improvement of 2.0 points, with a response rate of 93.7%, was observed after  $14 \pm 2$  days. At 3 months, the mean score improvement was 1.2 points with a response rate of 86%. Patient-reported metrics demonstrated an improvement in 91% ( $n = 71/78$ ) of subjects. The three studies used a standard injection technique, with a maximum 20 IU of incobotulinumtoxin A and 5 U abobotulinumtoxin A administered per band. Complications were reported in 15.4% ( $n = 12/78$ ) of patients, with none requiring further intervention.

**Conclusions:** Botulinum toxin is a highly effective treatment for isolated platysma bands. A safe injection technique is described and recommended for clinical practice.

## Level of Evidence: 4

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Restoration of a youthful neck is paramount in facial rejuvenation.<sup>1</sup> The status of the platysma muscle forms the basis of anterior neck aesthetics. The platysma is a flat, thin muscle located between superficial and deep cervical fascia. This muscle, in synergy with depressor anguli oris, stretches the skin of the neck downwards and laterally. Platysma bands are thickened vertical pleats that extend

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from the submandibular area to the parasternal region, widening the cervicomenal profile.<sup>2</sup> Platysma bands are characteristic of an aging neck,<sup>3</sup> presenting in isolation or with other senescent neck changes, including skin laxity, lipodystrophy, nasolabial jowls, and submandibular salivary gland ptosis.<sup>4</sup>

Platysma band surgery targets aspects of facial aging assumed to give rise to these vertical cords.<sup>5</sup> A variety of surgical techniques aim to correct decrease skin elasticity,<sup>6</sup> loss of platysma muscle tone,<sup>7,8</sup> and detachment from underlying structures,<sup>9</sup> in an attempt treat platysmal bands. However, achieving long-term aesthetic outcomes remains a challenge.<sup>10,11</sup> The causative link between cervical skin sagging and platysma bands has been questioned. An alternative proposal is that these bands arise due to muscle overactivity, yielding a hyperkinetic platysma.<sup>12,13</sup> This in turn justifies the chemical denervation of platysma bands with botulinum toxin, a technique that has been used successfully for the treatment of hyperkinetic facial mimetic muscles.<sup>14</sup> Concerns over the application<sup>15</sup> and safety<sup>16</sup> of botulinum toxin injection into the platysma have been raised. Therefore, the aim of this systematic review is to evaluate the efficacy, injection technique, and complications associated with botulinum toxin treatment of platysma bands in neck rejuvenation.

## METHODS

A systematic review of the literature was performed to identify articles reporting botulinum toxin injections for treatment of platysma bands. The search included published articles in three electronic databases—Ovid MEDLINE, EMBASE, and the Cochrane Library—between January 1985 and December 2017. The search strategy consisted of various combinations of the following search terms: “botulinum toxin” or “abobotulinumtoxinA” or “incobotulinumtoxinA” or “onabotulinumtoxinA” with “platysma bands” or “platysma muscle” or “neck” or “neck rejuvenation”. Manual search of references was also performed.

Eligible studies met the following inclusion criteria: patients who underwent botulinum toxin injections to platysma bands with recorded follow-up data. Studies were excluded if they met any of the following conditions: case reports, cadaveric studies, review articles, and letters to the editor. Studies were also excluded if adequate information was not provided on botulinum toxin injection technique and associated complications. Furthermore, studies were not included if they failed to use a validated platysma band assessment score and standard photographic methods to assess treatment efficacy. The hospital committee approved this study.

This systematic process of data selection is demonstrated in the PRISMA flow diagram (Figure 1). All duplicate studies were removed. Initial screening of abstracts included

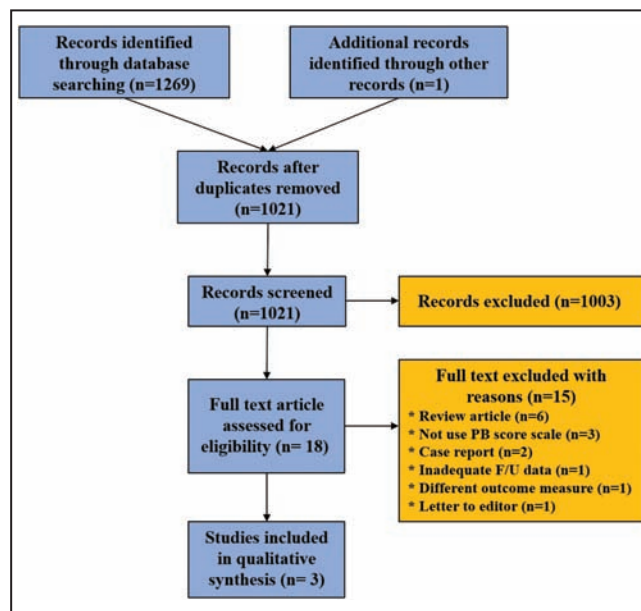
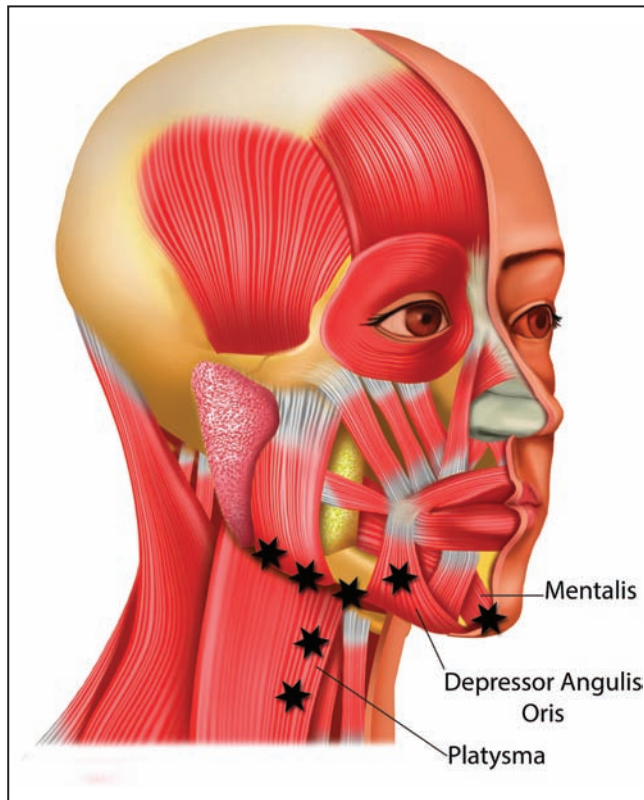


Figure 1. PRISMA flow diagram.

studies that fulfilled the inclusion criteria, while full-text evaluation removed studies that met the above exclusion conditions. Specific data were extracted from research which involved a subgroup of the study population that fulfilled the inclusion criteria. Information collected from studies included publication date, study design, follow-up period, patient numbers, and demographics. Information about botulinum toxin preparations, dosage, and injection technique was also collected. The assessment of botulinum toxin efficacy reported in the studies was also recorded. In this review, efficacy was defined as an improvement on the platysma band assessment scale from baseline to subsequent follow-up. In this study, the validated 5-point Merz dynamic platysma band scale was used. This quantitative photonumeric assessment scale provides both lateral and frontal views of platysmal banding, ranging from minimal (1) to severe banding (5). These scores were then expressed either as a mean score change over all subjects or as a percentage of patients who improved by at least 1 point on the assessment scale. If patient- or investigator-related outcome measures were used, they were expressed as a percentage of the number of patients who “improved” upon treatment. Data on complications and adverse outcomes were collected. Platysma band recurrence, presence of compensatory bands, and repeat botulinum toxin injections within the study period were also recorded. The level of evidence<sup>17</sup> was also determined for each article.

## RESULTS

Three studies met the inclusion criteria, with a total of 78 patients undergoing botulinum toxin injection for platysma

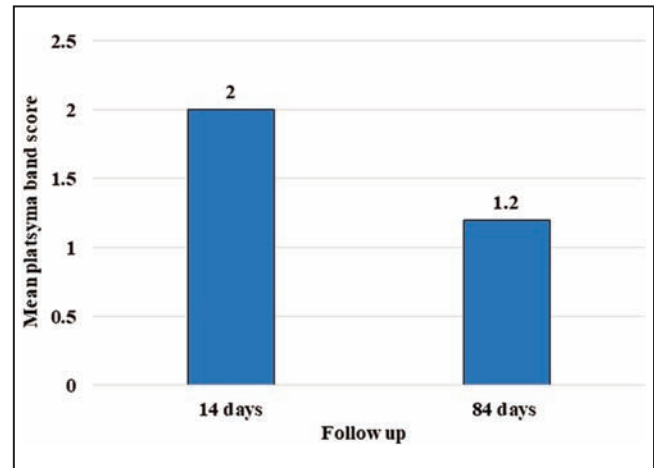


**Figure 2.** Schematic representation of the “Nefertiti lift.” This technique enables recontouring of the jawline through multiple injections of botulinum toxin into the neck and lower face.

bands treatment. All studies were prospective, with a mean number of patients of  $27.6 \pm 1.45$ . The majority of patients were female (77, 98.7%), with a mean age of  $52.26 \pm 1.34$  years. Each study incorporated a  $14 \pm 2$  day follow-up assessment with multiple other follow-up assessments that ranged in length from 3 to 147 days (mean follow-up: 87 days). All the studies were Level of Evidence 4.

## Technique

One study ( $n = 30$ ) included platysma band injections as part of a “Nefertiti lift.” This involved additional botulinum toxin injections into the border of the lower mandible (Figure 2). Incobotulinumtoxin A (Xeomin; Merz Pharmaceuticals GmbH, Frankfurt am Main, Germany) was used in 62.3% ( $n = 45/78$ ) of patients, with 38.4% ( $n = 30/78$ ) of patients receiving abobotulinumtoxin A (Dysport; Ipsen Ltd, Slough, Berks, UK). All injections were intramuscular, spaced 1–2 cm apart, into the most prominent part of the band with a range of 2–6 injections per band. The maximum dose per band was 20 IU incobotulinumtoxin A and 5 IU abobotulinumtoxin A.



**Figure 3.** Mean platysma score improvement on the Merz scale from baseline to 14 and 84 days post-botulinum toxin injection.

## Efficacy Assessment

The platysma bands of all patients in this review were evaluated through photographic assessment. Efficacy was assessed at  $14 \pm 2$  days post-injection. Two studies ( $n = 48$ ) provided further follow up at  $84 \pm 2$  days, allowing longer-term efficacy to be evaluated. All studies utilized the validated Merz 5-point photonic platysma band assessment scale<sup>18</sup> at baseline and at subsequent follow-up appointments. A mean baseline platysma band score of 2.63 was calculated by 2 studies ( $n = 48$ ). An improvement from the baseline platysma band score was observed at both  $14 \pm 2$  and  $84 \pm 2$  days. These results are graphically represented in Figure 3. Overall, 93.7% (45/48) of patients demonstrated an improvement of at least 1 in platysma band score after  $14 \pm 2$  days. A longer follow-up study demonstrated a score improvement of 1 in 84% (21/25) patients followed up at  $84 \pm 2$  days. Patient-reported outcome measures were used, with 2 of the studies ( $n = 55$ ) utilizing the Global Aesthetic Improvement Scale (GAIS)<sup>19</sup> and the other a slight variation of this ( $n = 23$ ). After botulinum toxin injection, 88.4% (69/78) of patients described a subjective improvement in neck appearance, with 62.3% (43/69) suggesting the appearance had “very much improved.” One study ( $n = 30$ ) using an investigator report outcome score demonstrated an improvement in 93.3% (28/30) of subjects. Thirteen patients required further injections: 10 were due to no change occurring in the platysma bands, and 3 were due to the development of compensatory platysma bands

## Complications

The complication rate for botulinum toxin injections into platysma bands was 15.2% (12/78). No complication

**Table 1.** Complications of Botulinum Toxin Injections into Platysma Bands

	Number	Percentage
Ecchymosis/hematoma	7	8.9%
Mild dysphagia	4	5.2%
Neck weakness	1	1.3%
Total	12	15.4%

required further invention. The most frequent complication was ecchymosis/hematoma. The results are displayed in [Table 1](#).

## DISCUSSION

Despite being a principal feature of the aging neck, the etiology of platysma bands remains controversial. Surgery is the mainstay treatment, centered on the assumption that platysma bands arise from decreased muscular tone secondary to cervical skin aging.<sup>15,20</sup> By demonstrating the absence of platysma bands on the paralytic side of unilateral facial palsy patients, Trévidic et al<sup>12</sup> suggested an overactive platysma as the cause of vertical banding. The greater platysma tone required to support the aging neck explains why platysma bands increase with age.<sup>21,22</sup> This systematic review demonstrates botulinum toxin to be a highly effective, safe, and well tolerated treatment of platysma bands. With the increased trend for patients to seek noninvasive facial rejuvenation techniques,<sup>23</sup> botulinum toxin injections seem likely to become the standard practice for treating isolated platysma bands.

Dosages (IU) of the various botulinum toxin type A preparations are not interchangeable. Differences in manufacturing, bacterial strain used, and the sizes of the nontoxic accessory proteins used create variations in potency.<sup>24</sup> In this review, both incobotulinumtoxin A and abobotulinumtoxin A were used; other studies have investigated onabotulinumtoxin A (Botox; Allergan Inc, Irvine, CA).<sup>25,26</sup> Incobotulinumtoxin A is a comparatively new preparation that displays efficacy similar to that of onabotulinumtoxin A.<sup>27</sup> Attempts to calculate conversion ratios for the doses of botulinum toxin preparations have focused on abobotulinumtoxin A and onabotulinumtoxin A, yielding values of between 1:1<sup>28</sup> and 11:1.<sup>29</sup> In assessing dosage equivalences for injecting platysma bands, an incobotulinumtoxin A:abobotulinumtoxin A ratio of 3–4:1 was demonstrated in this review to be both comparable and safe. A similar ratio has been used effectively for the treatment of hypertonic facial muscles.<sup>30</sup> Knowledge of botulinum toxin dosages is vital given the proximity of the platysma to muscles involved in deglutition and neck flexion. Dysphagic complications in this review were mild

and self-resolving. However, smaller doses of botulinum toxin have produced significant dysphagia,<sup>16,31</sup> emphasizing the importance of injection technique. This technique was standard across all studies examined in this review, and involved multiple incremental intramuscular injections into the most prominent part of the band. The prominence was created by asking the patients either to grimace or to pronounce the letter “e”. We advise the use of the doses and the safe injection technique outlined above to prevent unwanted diffusion of the toxin into the surrounding muscles.

The lack of a classification score to assess the degree of platysmal banding has resulted in patient (and physician) satisfaction levels becoming a standard measure of treatment efficacy.<sup>22,25,32</sup> Although essential,<sup>33</sup> satisfaction-related outcomes are inherently biased.<sup>34</sup> In an attempt to overcome this problem, 4-point platysma grading scales have been established,<sup>35,36</sup> although these lack validity. For aesthetic surgery as whole to expand in an era of evidence-based medicine, development of validated standardized metrics is essential. The studies in this review used the validated Merz 5-point photonumeric assessment scale of platysma banding at forced contracture.<sup>18</sup> This scale accurately reflects the 3-dimensional structure of platysma bands by incorporating both anterior and lateral photographs into the photonumeric scale. By omitting other senescence-related changes in the neck, this scale is limited to patients with isolated platysma bands only. Additionally, the lack of clinical use of this scale makes it difficult to establish an algorithm to govern subsequent treatment, as seen in other neck classifications.<sup>37</sup> Future studies should use this assessment scale in order to establish an evidence-based approach to the treatment of platysma bands.

The various surgical techniques used for neck rejuvenation are a consequence of the evolving knowledge of the aging process of the neck.<sup>38</sup> Surgery addressing platysmal banding includes platysma resection,<sup>39</sup> platysma midline plication,<sup>40,41</sup> and reattachment of platysma to the underlying fascia.<sup>42</sup> These operations are associated with complications<sup>43</sup> and long-term outcomes, including band recurrence, have been problematic.<sup>11,44,45</sup> More recently, closed platysmotomy has been described.<sup>46,47</sup> In this less-invasive procedure, marginal platysma resection is performed at the band’s prominence through multiple small stab incisions. The lack of long term follow-up studies makes evaluating recurrence rates with this procedure difficult. However, closed platysmotomy could potentially have a role in isolated thickened bands that are resistant to chemical denervation.

There are several limitations to this study. Firstly, the strict inclusion criteria explain the small number ( $n = 3$ ) of studies evaluated in this review. The omission of other larger studies due to a lack of standardized platysmal



banding assessment improves the homogeneity of the data, enabling an accurate pooled analysis. Women with mild to moderate platysmal banding was the only demographic assessed in this review, and therefore, it is difficult to extrapolate these results to men, younger patients, and those presenting with thickened bands. Further studies to assess botulinum toxin efficacy in these populations are required. All research in this review (and those excluded) were case series equating to Level of Evidence 4. This low quality of evidence is observed in all areas of aesthetic surgery.<sup>48</sup> Interesting, high-quality randomized controlled trials have been performed when assessing botulinum toxin injection treatment of the upper face.<sup>49</sup> Similar studies in neck rejuvenation are a necessity in order to compare different preparations and dosages. Given the size of the platysma muscle, longer follow-up studies are required to evaluate the potential development of antibody-mediated resistance to botulinum toxin injections.

## CONCLUSIONS

Despite the frequent use of botulinum toxin in denervating platysma bands, this technique has only recently been validated by improved knowledge of the relationship between plasma tonicity and banding. The effectiveness and safety of botulinum toxin for platysmal banding is clearly confirmed in this review. Neck rejuvenation surgery is still essential for patients presenting with multiple senescent changes, but for patients with isolated platysma bands chemical denervation with botulinum toxin should become standard practice.

## Disclosures

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