Cureus
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Open Access Case Report

Transient Anterior Open Bite Following Botulinum Neurotoxin Type A Injection Into the Muscles of Mastication: A Case Report

Review began 09/29/2026
Review ended 11/03/2026
Published 11/07/2026

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DOI: 10.7759/cureus.119271

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Abstract

Botulinum neurotoxin type A (BoNT-A) is used in dentistry and orofacial medicine for conditions including myofascial pain, bruxism, and hypertrophic masticatory muscles. Although treatment is generally well tolerated, weakness of the injected muscles can alter masticatory function and, less commonly, affect occlusion. We report a patient in her 30s with refractory myofascial temporomandibular disorder (TMD) pain who developed a transient anterior open bite after repeated BoNT-A injections into the muscles of mastication. Before treatment, she had a Class I incisal relationship with normal overbite and overjet. Approximately 10 weeks after the second treatment session, which used higher masseter doses than the first session, she noticed a change in her bite and separation between her upper and lower front teeth. Examination showed a 2-3 mm anterior open bite. Panoramic radiography showed no radiographic evidence of condylar resorption. The patient was managed conservatively. Progressive improvement was first documented approximately four months after the second BoNT-A treatment session, with complete restoration of incisal contact six months after the second treatment session. The clinical course is compatible with a transient neuromuscular disturbance, although causality cannot be proven from a single case. This case emphasises the need for careful injection planning, accurate dose documentation, baseline occlusal assessment, and counselling about possible temporary changes in bite force, mastication, and occlusion.

Categories: Other, Oral Medicine, Dentistry
Keywords: anterior open bite, botulinum neurotoxin type a, chemodenervation, malocclusion, masseter, masticatory muscles, orofacial pain, temporalis, temporomandibular disorder

Introduction

Botulinum neurotoxin type A (BoNT-A) is a protease neurotoxin produced by *Clostridium botulinum*. The active neurotoxin enters presynaptic nerve terminals and cleaves SNAP-25, a component of the SNARE complex, thereby inhibiting acetylcholine release and reducing neuromuscular transmission. The resulting weakness is temporary, as functional reinnervation and neuromuscular recovery occur over time [1].

BoNT-A has been used in a range of neurological, pain, autonomic, and aesthetic indications, and its use in dentistry and oral and maxillofacial practice has expanded to include selected patients with masticatory muscle disorders, bruxism, and facial muscle hyperactivity [2,3]. For myofascial temporomandibular disorders (TMDs), recent systematic reviews suggest that BoNT-A may reduce pain compared with placebo in some settings, but it has not consistently demonstrated superiority over established treatments, and concerns have also been raised regarding potential adverse effects on masticatory muscle and mandibular bone [4,5].

Changes in masticatory muscle activity can affect bite force and masticatory function. A 2024 systematic review of histological and functional effects of BoNT-A on masticatory muscles found that BoNT-A reduced bite force and muscle activity, although the extent and time course of recovery remained uncertain [6]. A 2024 randomised, triple-blinded clinical trial also found persistent changes in masseter muscle activity at six months following repeated BoNT-A injections, although masticatory performance did not differ significantly between treatment groups [7].

Anterior open bite following masseter BoNT-A injection has been reported previously [8]. Reports of this complication remain very limited in the published literature. Although evidence suggests that BoNT-A may reduce pain in selected patients with myofascial TMD, findings remain inconsistent, and careful patient selection is recommended given the limited understanding of potential effects on masticatory function and occlusion.

We describe a patient who developed a transient anterior open bite following repeated injections into multiple muscles of mastication and the subsequent spontaneous recovery. This case highlights a rarely

reported occlusal change following BoNT-A treatment and contributes to the limited literature regarding its potential mechanisms and clinical course.

Case Presentation

A patient in her 30s presented to our practice with chronic, refractory facial myofascial pain and a subjective report of crunching sounds from the left temporomandibular joint. Her secondary cosmetic concern was upper facial wrinkling. She was otherwise medically fit and well. Her dental history included fixed orthodontic treatment several years before presentation. Details of the original malocclusion, retention method, and long-term retention compliance were unavailable from the available records. There was no known history of anterior open bite before the BoNT-A treatment. She also had a history of chronic clenching and unsuccessful conservative management with a soft diet, non-steroidal anti-inflammatory medication, an occlusal splint, and physiotherapy. Details regarding the exact splint design and whether it was still being worn during the BoNT-A treatment period were unavailable from the clinical records and therefore could not be confirmed retrospectively. She had previously experienced partial improvement following BoNT-A treatment for muscles of mastication. Complete details of the earlier treatment, including the dose, muscles injected, timing, and whether any occlusal change occurred, were unavailable from the available records.

Pre-treatment examination demonstrated bilateral masseter and temporalis tenderness and tenderness over the left temporomandibular joint; no click was palpable. Mild bilateral jowling and glabellar, lateral periorbital, and forehead static and dynamic lines were also noted. The patient had a Class I incisal relationship with normal overbite and overjet. Baseline occlusion was documented clinically within the treatment record. No baseline photographs, study models, or intraoral scans were available for retrospective review. Maximum mouth opening and lateral and protrusive excursions were within normal limits, with no deviation on opening. A clinical diagnosis of myofascial pain with suspected left temporomandibular joint internal derangement was made. Because of persistent symptoms, BoNT-A treatment and possible left temporomandibular joint arthrocentesis were discussed. The patient elected to proceed with masticatory muscle injections and additional upper facial cosmetic anti-wrinkle injections.

Under aseptic conditions, Bocouture (incobotulinumtoxinA) was reconstituted using 2 mL of 0.9% sodium chloride solution, consistent with the current UK Summary of Product Characteristics for a 100-U vial, resulting in a concentration of 5 U/0.1 mL [9]. The product was injected into the bilateral masseter and temporalis muscles and the left lateral pterygoid muscle. The treatment record states 37.5 U to the left masseter, 2.5 U to the left lateral pterygoid, 15 U to the left temporalis, 30 U to the right masseter, and 15 U to the right temporalis. The injections were divided among multiple points within the target muscles using anatomical landmarks within safety zones. No immediate complications were reported. Additionally, a total of 42 U of BoNT-A was administered to the forehead, procerus, corrugator, and lateral periorbital regions for cosmetic treatment.

At the one-month review, the patient reported marked symptomatic improvement. Two months later, her previous symptoms had recurred. Examination was similar to the initial assessment, and a repeat treatment was undertaken using higher doses in the masticatory muscles. Ninety units were administered to the left masticatory muscles (60 U to the left masseter, 25 U to the left temporalis, and 5 U to the left lateral pterygoid) and 80 U to the right masticatory muscles (52.5 U to the right masseter, 22.5 U to the right temporalis, and 5 U to the right lateral pterygoid). An additional 30 U were administered to the three upper facial areas (forehead, glabella, and lateral orbital regions).

Approximately 10 weeks after the second treatment, the patient reported development of an open bite. Clinical examination demonstrated an anterior open bite measuring approximately 2-3 mm, assessed by vertical separation of the maxillary and mandibular central incisors at maximum intercuspation using a periodontal probe (Figure *1*), with preserved bilateral posterior molar contact. The open bite remained evident when the mandible was guided into a reproducible intercuspal position. However, a formal centric relation assessment was not recorded. There was no reported joint clicking, pain, or deviation on opening. Panoramic radiography showed no obvious radiographic evidence of condylar resorption. However, panoramic radiography cannot reliably exclude subtle early condylar remodelling or temporomandibular joint pathology. Additional imaging with CBCT or MRI was not obtained because symptoms improved spontaneously and complete occlusal recovery subsequently occurred.



FIGURE 1: Clinical photographs demonstrating the anterior open bite 10 weeks following botulinum neurotoxin type A injection into the muscles of mastication. (A) Right posterior view. (B) Frontal view demonstrating the anterior open bite. (C) Left posterior view.

This figure was created by the authors using original patient photographs.

Conservative management was undertaken. The patient was advised to follow a soft diet and avoid hard chewing during recovery. Approximately four months after the second treatment session, partial improvement in the anterior open bite was observed clinically. The occlusion continued to improve without further intervention. Six months after the second treatment session, full incisal contact had been restored, and the anterior open bite had completely resolved (Figure *2*). The patient's myofascial pain remained improved following treatment.



FIGURE 2: Intraoral optical scan images demonstrating complete resolution of the anterior open bite six months after the second BoNT-A treatment session. (A) Right posterior view. (B) Frontal view demonstrating complete incisal contact. (C) Left posterior view.

This figure was created by the authors using original patient data.

Discussion

This case describes a transient anterior open bite associated with repeated BoNT-A injection into the muscles of mastication. The relationship between BoNT-A and occlusion is biologically plausible but should not be overstated. A review of the effects of BoNT-A on the masticatory muscles reported changes in muscle structure and function, including reduced bite force, but also emphasised uncertainty regarding recovery and the limited human evidence base [6]. Seok and Kim have reviewed the broader concept that selective chemodenervation of masticatory or suprahyoid muscles can influence occlusion and mandibular stability [10]. A separate case report described an anterior open bite after masseter BoNT-A injection, further supporting the possibility of an occlusal effect [8]. A further case report, in which botulinum toxin was injected into the anterior belly of the digastric muscle to correct a post-traumatic anterior open bite, also illustrates that altering masticatory-related muscle activity can modify the occlusal relationship [11]. Importantly, the evidence does not establish that masseter BoNT-A routinely causes anterior open bite.

A similar transient occlusal change was reported by Ryu [8] in a 16-year-old female who received 25 units of BoNT-A into each masseter. Two weeks later, she developed a 2-mm anterior open bite with only bilateral second-molar contacts. No dental migration was identified on articulated casts, and temporomandibular joint CBCT showed no pathological changes. The occlusion was monitored without corrective treatment and returned to stable centric occlusion after four months. Similarly, the present case demonstrated a transient anterior open bite with preserved posterior contacts and progressive spontaneous improvement, with complete restoration of incisal contact by six months. However, the timing differed, as the open bite in the present case was recognised approximately 10 weeks after the second, higher-dose treatment. Differences in dose, muscles treated, and individual neuromuscular adaptation may account for the differing occlusal patterns observed. The delayed recognition of the occlusal change should be interpreted cautiously, as symptom recognition does not necessarily correspond to onset of the underlying muscular effects.

Experimental studies, many involving animal models and growing subjects, have reported reductions in mandibular condylar bone volume and density following BoNT-A injection into muscles of mastication [10]. Increased molar eruption and alterations in facial morphology have also been described in these experimental settings [10]. However, extrapolation of these findings to a skeletally mature adult over a relatively short observation period should be undertaken cautiously.

The most plausible mechanism is a temporary alteration in the balance of mandibular muscular forces following chemodenervation. As illustrated in Figure 3, the masseter, temporalis, and medial pterygoid muscles act primarily as mandibular elevators, whereas the lateral pterygoid and suprahyoid muscles contribute to mandibular translation and depression. Reduction in elevator muscle activity following BoNT-A injection may alter mandibular posture, closing force, and occlusal loading. Preservation of bilateral posterior tooth contact with separation of the anterior teeth suggests that altered mandibular position or redistribution of occlusal forces may have occurred rather than complete loss of occlusal contact throughout the dentition (Figure 3). Alternative explanations include altered lateral pterygoid function, posterior dental extrusion, or subtle changes in tooth position. However, because baseline records, serial scans, electromyographic data, and bite-force measurements were unavailable, the relative contribution of these mechanisms cannot be determined.

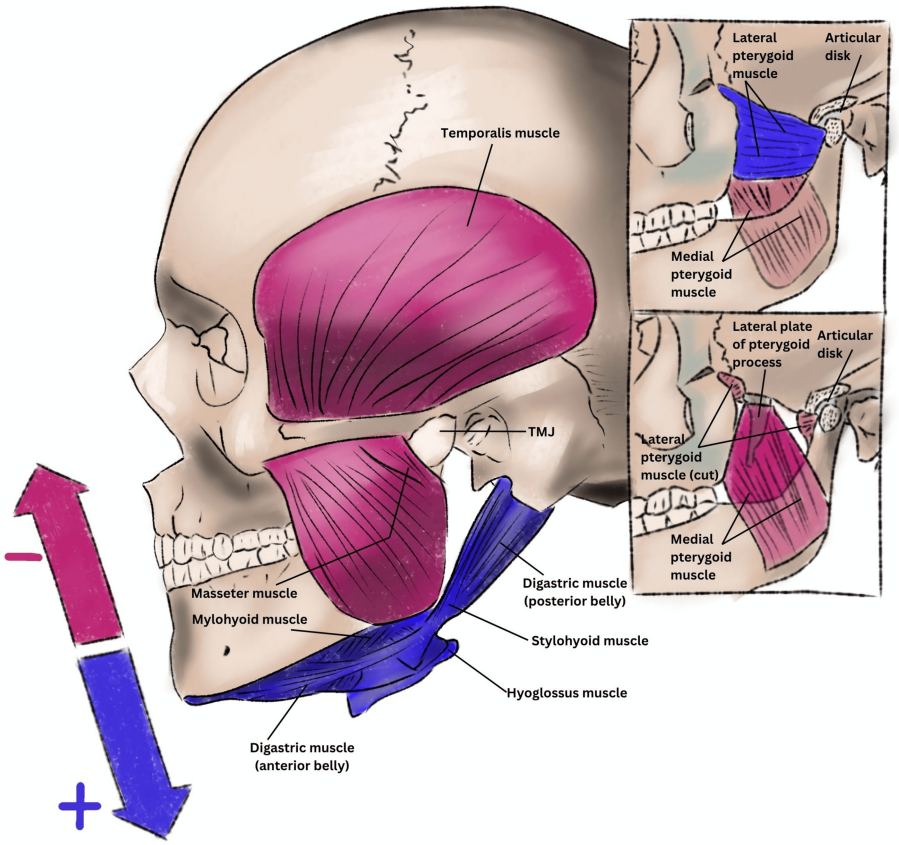


FIGURE 3: Mandibular jaw muscles and proposed force changes following BoNT-A treatment. Pink = elevators; blue = depressors/translators. (+) relatively increased muscle force/activity; (−) relatively decreased muscle force/activity. Proposed mechanism for transient anterior open bite.

This figure was created by the authors using the ibis Paint tool (https://ibispaint.com).

Several observations in the present case support a transient treatment-related neuromuscular disturbance. First, the pre-treatment occlusion was documented as normal. Second, the open bite developed after the second treatment session, during which the masseter doses were higher than during the first treatment session. Third, posterior tooth contact was retained, and panoramic imaging did not demonstrate condylar resorption. Finally, the occlusion returned to baseline without intervention, coinciding with the expected

recovery of muscle function following BoNT-A treatment. Nevertheless, sequential association alone cannot establish causality, and other unmeasured factors may have contributed to the observed occlusal change.

Alternative explanations should also be considered. The patient had a history of previous orthodontic treatment, although details of the original malocclusion, retention method, and compliance were unavailable. Information regarding previous occlusal splint use was also incomplete. While spontaneous recovery without intervention argues against established orthodontic relapse, these potential confounding factors cannot be excluded entirely. Similarly, subtle temporomandibular joint pathology cannot be ruled out because advanced imaging was not obtained.

Dose and product formulation require careful interpretation. BoNT-A preparations are not unit-for-unit interchangeable; the UK product information for Bocouture specifically states that its units are not interchangeable with those of other botulinum toxin type A preparations [9]. Published randomised trials and systematic reviews also use a wide range of doses and injection patterns, and no universally accepted protocol has been established for myofascial TMD [4,5]. The present case should therefore not be interpreted as defining a specific 'safe' or 'unsafe' dose threshold. Rather, it highlights that individual susceptibility and the combined effect of multiple injected muscles may matter clinically.

The effectiveness of BoNT-A injections for patients with muscular temporomandibular disorders has been investigated in the literature. A systematic review and meta-analysis of 15 randomised controlled trials found that BoNT-A was associated with a significant reduction in pain intensity compared to placebo [12]. However, an umbrella review of systematic reviews concluded that BoNT-A was comparable in effectiveness to standard treatments for muscular TMD and recommended that its use be reconsidered, with application potentially limited to selected patients with persistent symptoms in whom standard treatments have failed to provide adequate pain relief [5]. These findings highlight the potential therapeutic role of BoNT-A while also emphasising the importance of careful patient selection. The Bocouture product information states that local effects generally develop within days and that repeat treatment should not be administered more frequently than every three months [9]. The occlusal change in this case was first recognised approximately 10 weeks after treatment. Symptom recognition does not necessarily correspond to the onset of the underlying muscular effects, although this interpretation remains speculative because no interim examinations or occlusal records were available.

Conservative management was reasonable in this case because the open bite was small, the patient was asymptomatic, and there was no radiographic evidence in the available examination of condylar resorption. However, as reports of BoNT-A-associated anterior open bite remain extremely limited in the published literature, there is insufficient evidence to establish a standardised treatment protocol. Persistent or progressive malocclusion should prompt reassessment for dental, skeletal, muscular, and temporomandibular joint causes rather than assuming that the finding is solely toxin-related. In selected cases, injection of the anterior digastric muscle may also be considered as a potential treatment option for anterior open bite [11], although further evidence is required before this can be recommended routinely.

This report has several limitations. Baseline occlusion was documented clinically, but no pre-treatment photographs, study models, or intraoral scans were available. An intraoral scan was not obtained during the open-bite phase; therefore, comparison of tooth position and mandibular position over time was not possible. Different record modalities were used during the open-bite stage and recovery phase. The patient had a history of previous orthodontic treatment, and details regarding the original malocclusion, retention status, and compliance were unavailable, representing potential confounding factors. Details of previous BoNT-A treatment and occlusal splint use were also incomplete. Panoramic radiography cannot reliably exclude subtle early condylar remodelling, and neither CBCT nor MRI was performed. Electromyographic assessment, bite-force measurements, and standardised serial occlusal measurements were not available. Consequently, a causal relationship cannot be established definitively, and the precise mechanism remains uncertain.

Conclusions

BoNT-A injection into the muscles of mastication may be considered in selected patients with refractory orofacial pain, and temporary occlusal changes have been reported following treatment. This case suggests that a transient anterior open bite may develop following masticatory muscle chemodenervation and can resolve completely without active occlusal treatment. The exact mechanism remains uncertain, and it is difficult to determine which patient- or treatment-related factors may contribute to developing an anterior open bite.

The case does not establish a dose threshold or a definitive causal mechanism. Clinicians should document the baseline occlusion, use accurate and formulation-specific dose documentation, and counsel patients that temporary changes in muscle strength, bite force, mastication, and occlusion may occur. Persistent occlusal change should be investigated carefully rather than automatically attributed to BoNT-A, particularly where other potential explanations such as orthodontic relapse, temporomandibular joint pathology, or occlusal appliance effects may be present.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Zaid R. Al-Ali, Mohammed Anabtawi

Acquisition, analysis, or interpretation of data: Zaid R. Al-Ali, Mohammed Anabtawi

Drafting of the manuscript: Zaid R. Al-Ali, Mohammed Anabtawi

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Supervision: Mohammed Anabtawi

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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