

# Facial Harmony Restored: Botulinum Toxin in the Management of Masseteric Hypertrophy – A Case Study

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### Abstract

Masseter muscle hypertrophy (MMH) is a benign enlargement of the masseter muscle, often resulting in a square-shaped facial appearance and potential temporomandibular joint(TMJ) disorders. This case report highlights a 45-year-old Female presenting with TMJ pain, teeth clenching, and snoring. Clinical examination revealed bilateral masseter hypertrophy, classified as Type II, prompting a non-surgical treatment approach using botulinum toxin-A (Botox).

A six-point injection technique was employed for even toxin distribution, resulting in significant muscle volume reduction and improved facial aesthetics after six months. Additionally, a snoring device was prescribed, successfully reducing snoring and enhancing sleep quality. This report emphasizes the efficacy of the six-point Botox injection technique for Masseter muscle hypertrophy and underscores the need for standardizing this protocol through further research.

**Keywords:** Masseter Hypertrophy , Botulinum Toxin (Botox) , Six-Point Injection Technique, Temporomandibular Joint (TMJ) Disorders , Anti-Snoring Device (ASD).

## INTRODUCTION

The masseter muscle is one of the chief muscles of mastication. The width and volume of this muscle is set particularly by the biting force, chewing habits, type of food, diet, or para-functional habits like bruxism and other temporomandibular

joint disorders. Any of these can lead to masseter muscle hypertrophy (MMH), which provides a squarish appearance to the face or to the jawline.<sup>1</sup>

It is an idiopathic, benign, uncommon condition characterized by unilateral or bilateral enlargement of the masseter muscle and perhaps accompanied by pain, which is often confused with parotid swelling. Hence this swelling is a concern for facial disfigurement.

There are two treatment approaches: surgical and non-surgical. Surgical options include surgical reduction of the angle of the mandible and liposuction of the subcutaneous fat.<sup>2</sup>

Nonsurgical management includes use of anti-anxiety drugs, muscle relaxants, occlusal equilibration by splints/night guards and injecting botulinum toxin-A (Botox) locally into the hypertrophied muscle. Treatment approach varies from case to case and additionally from the type of prominence of mandibular angle.

Type I is when the enlargement is mainly due to muscle hypertrophy and can be appreciated when viewed from the front but appears normal when viewed from the lateral aspect. In such cases, Botox is recommended rather than a surgical method.

Type II is when the swelling owes mainly to prominence of angle and not much to hypertrophy of masseter muscles. Botox can be used for re-contouring the face in such cases.

Type III is due to both thick mandibular angle and hypertrophy of masseter muscles and it can be appreciated from the frontal and lateral view as well. Both muscle and bone being the cause, it can be resolved by surgery in conjunction with Botox injection.<sup>3</sup>

Botox (botulinum toxin) is a neurotoxin produced by the microorganism *Clostridium botulinum*. It causes flaccid paralysis induced by inhibiting acetylcholine release.<sup>4</sup>

This therapeutic effect continues for 3–6 months; within that period, it corrects the patterns of muscle exercises, decreases the squarish appearance of the jaw and alleviates pain by changing the patient's lifestyle.<sup>5</sup> Botox (botulinum toxin) is a neurotoxin produced by the microorganism *Clostridium botulinum*. It causes flaccid paralysis induced by inhibiting acetylcholine release.<sup>4</sup>

Snoring is a common condition caused by the vibration of soft tissues in the airway during sleep, leading to a harsh or hoarse sound. It occurs due to partial obstruction of the airway and can be influenced by factors such as obesity, nasal congestion, alcohol consumption, and sleep position. While occasional snoring is harmless, chronic snoring may indicate underlying health issues like obstructive sleep apnea (OSA).<sup>5</sup>

The side effects of snoring extend beyond disrupted sleep. It can lead to day time fatigue, headaches, difficulty concentrating, and irritability. In severe cases, it increases the risk of cardiovascular diseases, high blood pressure, and metabolic disorders. Additionally, snoring can affect

relationships due to sleep disturbances for both the individual and their partner. Addressing snoring through lifestyle modifications, medical interventions, or sleep studies is essential for overall health and well-being.<sup>6</sup>



**Figure 1:** (Front rest view)

Anti-Snoring device as an effective treatment option for managing snoring. These devices help maintain an open airway during sleep by repositioning the jaw, stabilizing the tongue, or enhancing nasal airflow, depending on the patient's specific needs. ASD as an effective treatment option for managing snoring. These devices help maintain an open airway during sleep by repositioning the jaw, stabilizing the tongue, or enhancing nasal airflow, depending on the patient's specific needs. By addressing the underlying causes of snoring, These devices contribute to better sleep quality and overall health.<sup>6</sup>

### **CASE REPORT**

A 45-year-old male reported to AHMEDABAD DENTAL COLLEGE AND HOSPITAL seeking treatment for clenching of teeth, TMJ pain and snoring. The patient confirmed a history of clenching and waking up everyday with a headache. (Figure 1)

Upon inspection, she had a square-shaped lower face with prominence at mandibular angle. When the patient was asked to clench her teeth, the prominence was increased. Upon palpation, abnormal thickening of masseter muscle (triplebulging Type IV, according to the classification given by Xie et al 2014) was observed. She was diagnosed with masseteric hypertrophy Type II, as classified by Kwon et al 2019.<sup>6</sup>



**Figure 2.1:** Left side profile view



**Figure 2.2:** Right side profile view

She wanted to opt for a non-surgical and minimally invasive therapeutic approach, hence injecting Botox into the masseter muscle was planned to correct the hypertrophied muscle. This involves injecting botulinum toxin into 6 points (anterosuperior, anteroinferior, posterosuperior, posteroinferior, mid-superior and mid-inferior), 5 units at each point on the right and 6 units at each point on the left, since more bulk was observed on the left side. The 6- point technique is aimed at effective and equal distribution of Botox over the entire width of the muscle. Standard dilution ratio used was 2.5 mL of normal saline into 100 units of botulinum toxin. Before starting the procedure, topical anesthesia was given bilaterally at the mandibular angle area.

The patient was then asked to clench and hold her teeth to mark the anterior border and most prominent bulge of the masseter. A line was drawn from the tragus to the corner of the mouth indicating the superior boundary and the inferior boundary was marked with the aim of restricting the injection site 1.5–2 cm away from the lower border of the mandible to avoid injury to the marginal mandibular nerve. Six equidistant points (anterosuperior, anteroinferior, posterosuperior, posteroinferior, mid- superior and mid-inferior) were marked.

Botox was injected perpendicularly with a 1-cc syringe into the bulk of the muscle. This was repeated for 6 points and further on the other side. Each point was injected with 5 units and 6 units on the right and left side, respectively, a total of 30 units and 36 units, respectively, at each muscle. Ice pack is post-operatively to control bleeding. For the treatment of snoring we prescribe ASD (Anti-snoring device) (company name: SMARTGUARD). By addressing the underlying causes of snoring, these devices contribute to better sleep quality and overall health.<sup>17</sup>

For the construction of an anti-snoring device in our department involves advanced scanning techniques like intraoral scanning for precision. These digital scans are used in lab for CAD/CAM software to design a custom-fit mandibular advancement device (MAD) that repositions the lower jaw to maintain an open airway. The device is then fabricated in laboratory using 3D printing or milling, ensuring accuracy and comfort. After fitting and adjustments, periodic follow-ups are conducted to optimize effectiveness.



**Figure 3: ASD (anti-snoring device)**



**Figure 4**  
(Front rest view)



**Figure 5**  
(Right side profile view)



**Figure 6**  
( Left side profile view)

## RESULTS

Significant reduction in the distance from the angle of the mandible to the most prominent point of the chin (pogonion) was observed between pre-treatment and 6 months follow up.(Figure 4 )

Upon palpation, the thickness of muscle was significantly reduced and extraoral photography confirmed the change in facial contour and reduction in prominent the angle of the mandible. (Figure 5 & Figure 6). The snoring device work efficiently and it reduces the snoring and patient's breathing pattern got regulated. Patient is satisfied with results and sleeping improved.

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## DISCUSSION

Several techniques of injecting botulinum toxin-A into masseter muscle have been employed in the past. Some authors advocate multi-point injection technique since it allows a better distribution of the toxin in the muscle, while some advocate the use of the lowest injection sites possible or a single injection site. There is high heterogeneity in the injection protocol followed by previous literature as there is no standard protocol implemented for injection technique.<sup>7</sup>

Kwon et al, in their study, injected the toxin into the most prominent bulge of masseter. The most important concept while injecting the masseter with botulinum toxin is to restrict the injection site within the boundaries of the muscle to avoid complications.<sup>3</sup> Kim et al made four injection points, 2 marked on a line from tragus to corner of mouth 1 cm apart and the other two given 1 cm above and below this reference line.<sup>6</sup> Lindern et al injected at two sites, one at angle of mandible and the other one in the zygomatic arch.<sup>9</sup> Baet al employed a 3-point injection technique, one point inferior to the tragus mouth line at the thickest point of muscle and two points 1 cm away from the anterior and posterior borders of the masseter, respectively. This helps to reduce the probability of damaging the risorius muscle and parotid gland.<sup>11</sup> Mandel et al employed a 5-point injection technique involving the most bulging points.<sup>12</sup> A more recent technique uses ultrasound-guided injection at 2–4 points, 1.5 cm apart within the borders of the muscle and tragus–mouth line.<sup>13</sup> Advanced diagnostic aids, including CT,<sup>9</sup> MRI, panoramic radiography,<sup>10</sup> 3D volumetry, serialultra, sound, electromyography,<sup>14</sup> etc. can be performed periodically to assess the effect of botulinum toxin on masseteric hypertrophy in successive visits. Most of the studies mentioned above have evaluated the effectiveness of their technique by visual examination and few have employed advanced diagnostic aids like periodic electromyography, serial ultrasound, MRI, etc. However, the exposure of the patient to radiation is an added risk in these techniques. Xie et al, in their study, classified masseter muscle hypertrophy using a combination of clinical palpation, ultrasound and anatomical dissection and proposed a tailored botulinum toxin type A injection protocol for dosage and injection sites. Five different bulging types of the contracted masseter – minimal, mono, double, triple, and excessive – were classified and treated with different injection protocols and produced satisfactory results.<sup>14</sup>

Shome et al, in their study, compared the long-term effectiveness of botulinum toxin across groups that received subsequent injections and found that the patients who received three injections exhibited very high reduction of masseter muscle volume, around 38.72% until second follow up year,

Which implies that subsequent injections are lesser.<sup>15</sup>

In our case report, 15–25% reduction was seen in a follow-up period of 6 months, with a single injection. The patient will be followed up for subsequent injections for long-term management.

This case report proposes a new method to quantify prognosis by measuring important anatomical landmarks; ie, the distance from the angle of the mandible to the most prominent point of the chin (pogonion) was compared in subsequent visits to evaluate the effectiveness of botulinum toxin on masseter hypertrophy. We claim that our technique is the simplest, fastest, safest and most economical, with minimal discomfort to the patient, and the injection technique showed excellent results and patient satisfaction over a follow-up period of 6 months. Patients used snoring devices as part of their treatment plan often report high levels of satisfaction due to significant improvements in sleep quality and reduced snoring intensity. These devices provide a non-invasive solution that effectively addresses snoring, enhancing overall well-being and restoring restful sleep for both the patient and their sleep partner.

The use of snoring devices has proven to be a highly effective treatment for this patient suffering from snoring. She experience noticeable improvements in sleep quality, reduced snoring frequency, and enhanced overall well-being. Their satisfaction is largely attributed to the non-invasive nature of the devices, ease of use, and significant positive impact on their sleep and daily life. In our case patient wore it regularly and her sleeping pattern improves and she is very satisfied with the results.

## CONCLUSION

Botulinum toxin-A injection is a non-invasive, safe, and effective treatment for masseter muscle hypertrophy. The 6-point injection technique was found to be effective, patient satisfactory, with a good outcome over a 6-month follow-up period and we recommend its use for effective and uniform distribution of Botox into the masseter muscle. The clinical method for evaluating muscle bulk is an economical alternative to radiographic techniques. The anti-snoring device evaluated in this study proved to be an effective, non-invasive solution for reducing snoring and improving sleep quality. Its mechanism of action, which optimizes airway

patency, resulted in significant patient satisfaction and adherence over the follow-up period. The device demonstrated ease of use, comfort, and a favorable safety profile, making it a practical option for individuals seeking relief from snoring.

## LIMITATION AND FUTURE SCOPE

This injection technique has to be implemented with more cases to prove its efficacy and safety. Comparison with other injection techniques must be done in the future to determine its superiority over conventional techniques and derive a standard protocol for injection of botulinum toxin in masseter muscle hypertrophy.

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