

Efficacy of Incobotulinum toxin-A for the treatment of masseter muscle hypertrophy in Asian Indian patients: A 2-year follow-up study

Debraj Shome MD, FRCS (Glasgow), MBA¹  | Sapna Vadera MDS²  |
Male Shiva Ram M.Optom³ | Rinky Kapoor MD⁴ 

¹Department of Facial Plastic Surgery, The Esthetic Clinics, Mumbai, India

²Facial Plastic Surgery and Facial Cosmetic Surgery, The Esthetic Clinics, Mumbai, India

³The Esthetic Clinics & School of Medical Sciences, University of Hyderabad, Hyderabad, India

⁴Department of Dermatology, Cosmetic Dermatology and Dermato-Surgery, The Esthetic Clinics, Mumbai, India

Correspondence

Dr. Debraj, Shome The Esthetic Clinics, Kandivali East, Mumbai, 400101, India.
Emails: debrajshome@gmail.com; debraj.shome@theestheticclinic.com

Abstract

Background: With the changing trends, more and more patients are opting for non-surgical or minimally invasive options for reshaping the face. Noninvasive treatments such as incobotulinumtoxinA (Xeomin Cosmetic®; Merz Pharma Canada Ltd., Burlington, ON, Canada) are a preferred modality for reducing the volume of the muscle and therefore reducing the width of masseter.

Aims: To evaluate the efficacy of Xeomin treatment in long-term management of bilateral masseter hypertrophy in Asian Indian patients.

Patients/Methods: A total of 30 patients were enrolled in the study and were injected with 30 U Xeomin on each side of face, at baseline. Fifteen patients received a second session of Xeomin injection at 12th week, and remaining 15 patients received an additional third session, at 12th and 24th weeks post the first injection, respectively. Follow-up was done at 4th-, 12th-, 24th-, and 36th-week and at first- and second-year follow-ups.

Results: For the patients who received two injections, the maximum reduction of 26.85% was observed at 24th week, which was maintained as 20.04% reduction until second follow-up year. The patients who received three injections exhibited very high reduction of 43.12% of masseter volume at 36th week, which was maintained at 38.72 % until the second follow-up year. Three sessions of Xeomin injections were proved to be more effective in long-term maintenance of reduced masseter volume than 2 sessions of injections.

Conclusions: Xeomin injections were found to be effective in long-term management of bilateral masseter hypertrophy. This is the first of its kind paper, which evaluates the long-term effects of Xeomin injections for the treatment of masseter hypertrophy.

KEYWORDS

incobotulinumtoxinA, masseter muscle hypertrophy, Xeomin

1 | INTRODUCTION

Facial beauty and its perception are significantly influenced by cultural background. One of the important distinctive traits of an Asian face is a square-framed lower half of the face.¹ This feature is less acceptable to female patients, who consider almond- or ovoid-shaped face as the prototype of beauty. Thick mandibular bone contributes to the enlargement of the lower half of the face in the ramus area, the prominent mandibular angle, the soft tissue, and most importantly the bulk of the masseter muscle.² It was in 1880 when Legg witnessed concurrent idiopathic temporalis muscle hypertrophy in a 10-year-old girl and subsequently described it as masseter muscle hypertrophy. Hypertrophy of masseters can change the facial lines, making the patients more conscious and skeptical about their appearance.³ Numerous modalities are available to reduce the bulk of the lower half of the face, including the surgical and nonsurgical modalities. With the changing trends, more and more patients are opting for nonsurgical or minimally invasive options for reshaping the face.¹

IncobotulinumtoxinA (Xeomin Cosmetic®; Merz Pharma Canada Ltd.) is the US FDA-approved neurotoxin and is used for the management of adult patients with blepharospasm and cervical dystonia. It is also used for the treatment of moderate-to-severe frown lines between the eyebrows. The bacteria causing botulism are used for preparing incobotulinumtoxinA. It works on the basic physiology of reduced muscle activity by means of transient nerve conduction blockage. Its use for masseter muscle hypertrophy works on the similar principle with the subsequent reduction in the bulk of the muscle.

OnabotulinumtoxinA (Botox®, Vistabel; Allergan, Inc.) has similar actions, and it has been proved to be efficacious in the long-term treatment of masseter muscle hypertrophy.^{2,4,5} However, incobotulinumtoxinA has several advantages over onabotulinumtoxinA. As per the manufacturer's information sheets, incobotulinumtoxinA is potent in maintaining the efficacy at higher temperatures as compared to later.^{6,7} Its distribution is simplified by the fact that it does not require refrigeration prior to its use. IncobotulinumtoxinA can very well be compared with onabotulinumtoxinA with respect to onset and duration of action, owing to the fact that it starts showing effect as early as one week after administration and the effectiveness is maintained from 3 to 6 months.⁸ Our body tends to develop antibodies when it comes in contact with a foreign substance. Theoretically, these antibodies can lead to a decrease in the overall efficacy of the neurotoxin. As incobotulinumtoxinA lacks additives, the risk of antibody formation against incobotulinumtoxinA is far less than any other neurotoxin currently available. Previous literature reported that incobotulinumtoxinA was the first botulinum toxin drug in which the complexing proteins (CPs) were removed. Lack of CPs may further reduce its antigenicity.⁸

The available literature on large randomized, double-blinded studies has demonstrated the therapeutic effectiveness of incobotulinumtoxinA against cervical dystonia, blepharospasm, and spasticity.⁹ Shome et al⁴ have already published a 4-year follow-up paper that demonstrated long-term use of onabotulinumtoxinA for the hypertrophied masseter muscle, subsequently narrowing the

width of the lower half of the face. Also, there are few short-term studies on incobotulinumtoxinA comparing the results of single-injection technique and multiple-injection techniques for reducing the masseter muscle hypertrophy.¹⁰ Past studies by Shome et al⁷ highlighting the diffusion characteristics of incobotulinumtoxinA mentioned that the propensity of side effects may be higher with incobotulinumtoxinA as compared to onabotulinumtoxinA owing to the dispersion properties of incobotulinumtoxinA. This could lead to complications with incobotulinumtoxinA when the same injection sites are used for the reduction of masseter hypertrophy, as in onabotulinumtoxinA. Increased dispersion could theoretically disperse into the buccinator muscle and impact the smile of the patient. Since there is no study currently that describes the long-term efficacy of incobotulinumtoxinA for the maintenance of reduced masseter muscle width, we decided to focus on assessing the efficacy of injection of incobotulinumtoxinA for the treatment and long-term management (2 years) of bilateral masseter muscle hypertrophy in Asian Indian patients.

2 | MATERIALS AND METHODS

2.1 | Patients

A prospective interventional trial was carried out from July 2017 to July 2019. The patients included in the study had the requirement of lower face contouring. Individuals below 18 years of age, patients with local trauma, pregnant and lactating female patients, patients with cow's milk protein allergy, bruxism, associated dental issues, myasthenia gravis, and prominent mandibular angle, patients who have received injections of incobotulinumtoxinA for the same purpose in the past 12 months, and those patients who were non-Indian in origin were the major exclusion candidates. The study comprised of 30 patients (15 female and 15 male with the mean age of 39.7 ± 15.5) having hypertrophied masseter muscles bilaterally. Also, all these patients were Asian Indian in origin and requiring slimmer and more aesthetic lower half of the face. Consents were taken in both oral format and written format. Ethical clearance for the study was taken from the concerned Institutional Ethical Committee.

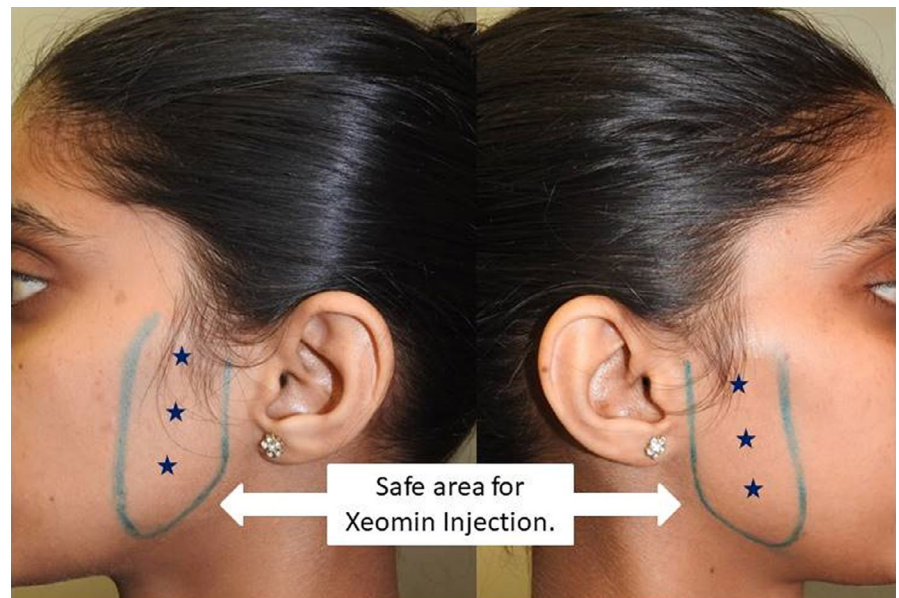
2.2 | Dosage and dilution

IncobotulinumtoxinA (one vial) contains 100 units of lyophilized BTA. Reconstitution is done by adding 2 mL of nonpreserved normal saline in 100 units of BTA. This yields a final solution with a concentration of 5 U of BTA/0.1 mL of normal saline.

2.3 | IncobotulinumtoxinA injection

Before injecting the solution, a secure area for the injection was identified by asking the patients to strongly grind their teeth and

FIGURE 1 Site for application of Xeomin injection. Safe area marked with green depicts the anterior limit (anterior border of mandibular ramus), posterior limit (posterior border of mandibular ramus), and inferior limit (insertion of masseter muscle at the inferior border of mandible and angle of mandible). Star sign marked with blue depicts the site for Xeomin injection (3 sites per side). 10 units of Xeomin is injected per site (total of 30 units per side)



then delimiting a reference line between the angle of the mouth and the lower implantation of the ear. The anterior and the posterior borders of the muscles were also identified and outlined, with the inferior border and angle of the jaw being the inferior extent of the marked area. The area thus marked was observed as the safe zone, considering that the area does not contain any important anatomical structures. Three points were marked on each side (1 cm apart) using a marker pen, depicting the site of injection (indicating the upper, middle, and lower third of the muscle). 30 IU of incobotulinumtoxinA was injected on each side of the face using 26 G and a 1-inch tuberculin syringe. 10 IU of incobotulinumtoxinA was administered at each point (Figure 1).

2.4 | Treatment sessions

The incobotulinumtoxinA injections were performed at baseline and at follow-up sessions. Initial session 1 was considered as a baseline, followed by session 2 at 12th week and session 3 at 24th week, and the final follow-up of all the participants was done for 2 years. The need for a repetitive injection session was assessed depending on the thickness of the masseter muscle in successive follow-ups.

2.5 | Efficacy measurements and scaling used

Objective and subjective assessments were done for measurement. Objectively, the masseter muscle volume and also the mean reduction in the thickness of masseters bilaterally were measured with the help of 8-MHz B-scan ultrasonography (USG). These measurements were done at baseline, 1, 3, 6 months, 1 year, and 2 years after the treatment. Clinician's and patients' self-assessment scores were used for the subjective assessment. Standardized photographs were

taken and documented at the beginning of the study and all the follow-up sessions using similar lighting, patient positioning, and camera settings. Clinical assessment was done by three blinded plastic surgeons who assessed the masseter muscle reduction by comparing the before and after photographs of each patient (Figure 2). The self-assessment form given to the patients regarding the improvement and pain during the procedure given to the patients is as mentioned in Table 1 and Table 2.

2.6 | Data collection and statistical analysis

All the collected data were stored in the Microsoft Excel, and the variables measured for each patient in the group were interpreted by the mean and SD. Descriptive statistics were used to evaluate the thickness and also the percentage of masseter muscle reduction. Paired *t* test was used for calculating the mean difference in the reduction of masseter muscle volume between each follow-up session within the group and between two groups. As the data were distributed normally, the parametric test was used to see the significance in between the groups. The entire statistical calculations were done using GraphPad Prism version 6 software. A *P*-value <.05 was considered as statistically significant.

3 | RESULTS

A total of thirty patients were analyzed (15 male and 15 female). In patients who received two injections, a 13.62% ($P < .0001$) reduction in the muscle size was observed at 12th week, with a maximum reduction of 26.85% ($P < .0001$) at 24th week. This was maintained as an average reduction of 20.04% ($P < .0001$) till 2 years of follow-up. The patients in whom three injections were given demonstrated the same results during the first two sessions with very



FIGURE 2 Patient photographs depicting the change in facial contour after Xeomin injections

high reduction of 43.42% ($P < .0001$) in the volume of the masseter muscle at 36th week, which was steady as an average of 38.72% ($P < .0001$) until the second follow-up year. It was noted that three sessions of incobotulinumtoxinA were more efficacious as compared to two sessions for the long-term maintenance of reduced masseter muscle volume (Table 3, Figures 3-4).

Slight amount of discomfort in the form of pain was recorded at the injection site, in approximately 22% of the patients, mostly during mastication. None of the patients experienced pain for more than 24 hours postinjection. However, no other noteworthy side effects were seen during or after the treatment.

4 | DISCUSSION

The hypertrophy of masseters is multifactorial in origin, ranging from microtrauma, emotional stress, hyperfunction or parafunction of the muscle, and chronic bruxism.^{11,12} Apart from presentations such as localized pain and trismus, asymptomatic jaw enlargement in the angle region at 20-40 years of age irrespective of the gender is the commonest presentation.¹³

Although treatment and management of masseter muscle hypertrophy is not usually an emergency, still it is most often carried out for aesthetic and cosmetic effects.¹⁴

TABLE 1 Patient Satisfaction Assessment Scores

Scale	Improvement
0	None or worsening-no improvement
1	If improvement present, then how much is the improvement in percentage, 1%-20%
2	21%-40%
3	41%-60%
4	61%-80%
5	81%-100%

TABLE 2 Pain Assessment Scores

Score	Pain
0	No pain
1	Very mild pain
2	Mild pain
3	Moderate pain
4	Severe pain
5	Very severe pain

TABLE 3 The average percentage of masseter volume reduction in two groups of patients at various follow-up times

	% Mean reduction in 2 sessions	% Mean reduction in 3 sessions	Paired t test
Week 0	0	0	0
Week 4	8.65	8.94	$P = .004$
Week 12	13.62	12.53	$P < .001$
Week 24	26.85	20.52	$P < .001$
Week 36	24.03	43.42	$P < .001$
Year 1	21.64	40.89	$P < .001$
Year 2	20.04	38.72	$P < .001$

Surgical and nonsurgical facial contouring of the jaw angle is not uncommon. Surgical contouring of the bulging angle of the mandible by limited excision of the masseter muscle or by the means of bony osteotomy is very well documented in the literature, but the efficacy is less compared with BTA injections and also the postoperative complications are higher.^{15,16} Moreover, surgical techniques are more invasive, require longer healing time, and may result in postoperative sequelae including infection, hematoma, facial nerve paralysis, nerve damage, trismus, asymmetric resection, and irregular contour lines. Also, complications from general anesthesia may occur and may not give good and positive results to the patients.¹⁷

Reducing the bulk of masseter muscle by means of BTA injections, creating "disuse atrophy" is a very common nonsurgical technique for lower facial contouring.¹⁸ BTA acts by inhibiting the release of the acetylcholine neurotransmitter by acting on the peripheral cholinergic motor nerve endings at the neuromuscular junction, which ultimately reduces muscle action.¹⁶ BTA has proved to be effective as an off-label drug for reduction of masseter bulk, thereby helping for aesthetic facial contouring.^{2,19-23} Approximately 20-50 U

intramuscular injection of BTA is suggested based on the thickness of the masseter muscle.¹⁷

There are pieces of evidence that suggest that the effect of BTA is short-term and is decreased within 4 to 6 months postinjection.¹³ In a study on Brazilian women by Klein, a maximum of 11.9% reduction in the bulk of the muscle was observed at 12th week after injection, which reduced to 5.47% at 24th-week follow-up.²¹ Kim et al (2003) noticed an average of 22% reduction at 12th week (0-17). Yu et al²⁴ in 2007 reported similar results with a 31% reduction in masseter volume after BTA treatment.

However, none of these studies maintained a long-term follow-up of the patients. A 4-year long-term follow-up study by Shome et al in 2019 showed a maximum of 26.6% reduction in the masseter muscle volume at 24th week after injection, which was maintained up to 24.43% at 4 years of follow up. In the same study, they gave the third dose of injection to 50% of the subjects, showing a maximum of 42.52% reduction at 36th week, which was maintained up to 40.64% at the end of 4 years.⁴

Three products containing botulinum toxin are available in the market: Botox (onabotulinumtoxinA), Dysport (abobotulinumtoxinA), and Xeomin (incobotulinumtoxinA). All these three preparations work on the same principle. However, they differ in the potency and the presence and absence of complexing proteins; hence, dose equivalence is significant in clinical practice and it varies from clinician to clinician to see the positive results leading to the cosmetic advantages.²⁵ All the studies mentioned above were done using onabotulinumtoxinA injections for reducing the masseter muscle hypertrophy. However, on a detailed literature search, no such long-term studies highlighting the efficacy of intra-masseter incobotulinumtoxinA injections for the long-term maintenance of reduced masseter muscle volume were found.

Another study by Shome et al in 2019⁷ comparing the efficacy of onabotulinumtoxinA with incobotulinumtoxinA in a split-face trial revealed that the effects of the forehead lines treated with onabotulinumtoxinA were short-lived (8.3 weeks) compared with the same amount of incobotulinumtoxinA (10.1 weeks) used for the treatment in other half of the forehead. Also, the sides treated with onabotulinumtoxinA were less improved compared with the sides treated with incobotulinumtoxinA. The better longevity and efficacy of incobotulinumtoxinA in this study were attributed to incobotulinumtoxinA, which was more stable than onabotulinumtoxinA when stored at higher ambient temperatures.⁷

The average percentage of masseter volume reduction in two groups of patients at various follow-up times

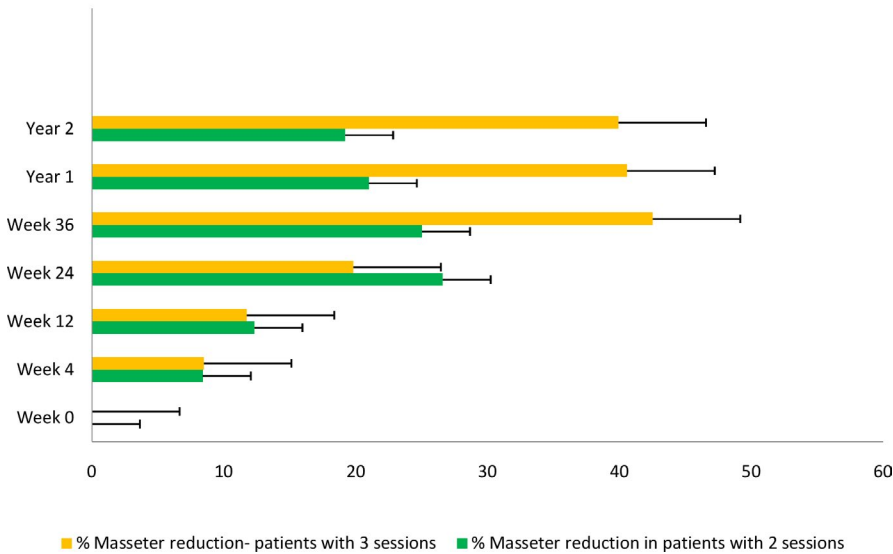


FIGURE 3 The average percentage of masseter volume reduction in two groups of patients at various follow-up times

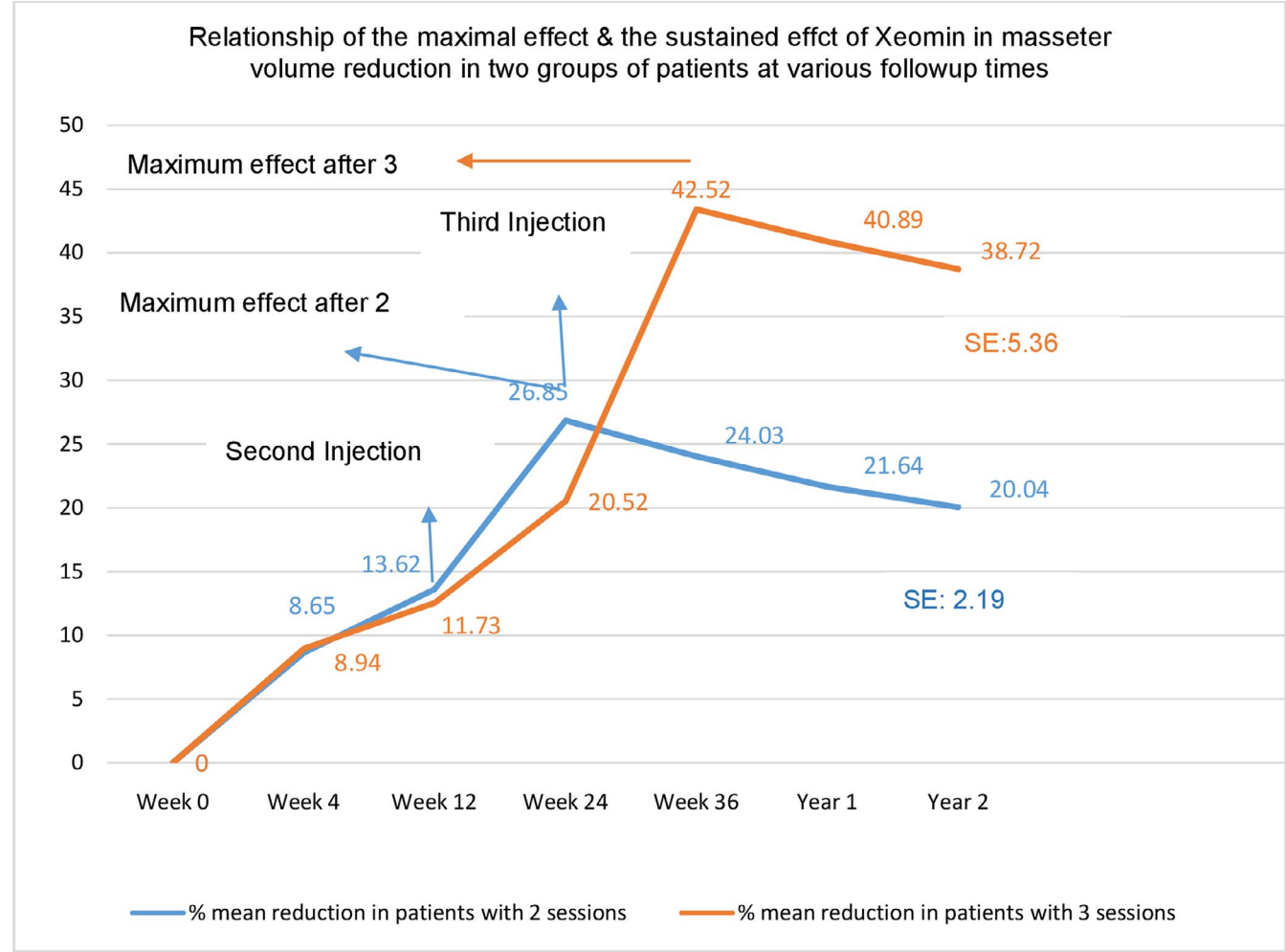


FIGURE 4 Relationship of the maximal effect and the sustained effect of Xeomin in masseter volume reduction in two groups of patients at various follow-up times

The results of our 2-year follow-up study were similar to Shome et al (2019)^{4,5} and showed a 26.85% reduction in the masseter muscle volume by 24th week, which was maintained at 20.04% at the end of 2 years. Also, it was noticed that patients who received three injections maintained better mean reduction of masseter volume (38.72%), compared with the patients who received 2 injections (26.85%) till the second year. Apart from this, it was also reported on clinical assessment scores that the patients were most improved or improved between follow-up sessions explaining the efficacy of incobotulinumtoxinA for maintenance of reduced masseter muscle hypertrophy. The longevity of the results of our study was shown to expand into the 36th week postinjection. This was in sync with the study by Andrean et al study where the improvement with incobotulinumtoxinA was found better from 16 to 20 weeks for two sessions in Caucasian population.¹⁰

In 2014, Lee et al²⁶ carried out a double-blind, randomized, and split-face study in which 56 subjects randomly received incobotulinumtoxinA and onabotulinumtoxinA on each side of their face. It was reported in the results that the safety and efficacy of both the products used in the study were equivalent. However, reduction of masseter muscle volume between our study and the previous study by Shome et al⁴ on onabotulinumtoxinA suggests incobotulinumtoxinA is more efficacious in the maintenance of reduced masseter muscle volume. This can be due to the storage advantages of incobotulinumtoxinA in tropical countries such as India. Thus, it can be effectively used for long-term treatment and management of masseter muscle hypertrophy bilaterally in patients of Asian Indian origin. Also, three injections are better and more effective as compared to a single dose. As we know that BTA, in higher concentrations, causes cell apoptosis and subsequently leads to muscle atrophy. Thus, on repeated injections muscle fiber regeneration is delayed or prevented, hence leading to muscle atrophy.^{27,28} Also, as mentioned in the literature, unlike skeletal muscles, regeneration of human jaw muscles is far limited.²⁹

In a comparative, split-face study on 30 patients done by Shome et al in 2019,⁷ 25U of onabotulinumtoxinA and 25U of incobotulinumtoxinA were injected on the forehead wrinkles on either side. Two patients developed mild ptosis on the side where incobotulinumtoxinA was injected. It was hypothesized that smaller molecular size and fewer aggregating proteins in incobotulinumtoxinA compared with onabotulinumtoxinA might have caused diffusion of the same beyond the intended area of treatment leading to ptosis.⁷ In our study, the injection points for incobotulinumtoxinA were same as the injection points used by Shome et al⁴ in their study on onabotulinumtoxinA for masseter hypertrophy, and no significant side effects were noted. The reason for the same could be the depth of the injection, which was deep into the masseter muscle belly, thereby reducing the chances of the anterior dispersion into the muscle surrounding the oral commissure, including the buccinator.

Past studies have also reported that excess of BTA can lead to a round face and distinctive lower jaw problems and the face may appear heavy. However, in our study no such incidents or cases were reported in the 2 follow-up years.³⁰ Also, we have demonstrated

that the aging process in faces itself leads to the lower face and the neck becoming heavier and losing definition. Therefore, the use of Incobotulinum toxin A and other forms of botulinum toxin A may become even more important to maintain the facial proportions, as per the golden ratio, as humans age.^{31,32}

5 | CONCLUSION

IncobotulinumtoxinA injections are equally effective for the treatment of masseter hypertrophy irrespective of the age and gender of the patient. Our study suggests that doses of incobotulinumtoxinA repeated 3 times at an interval of 12 weeks, accelerates the reduction of the masseter muscle, and helps in maintaining the reduced masseter muscle volume for up to 2 follow-up years, with adequate facial contour. Also, no significant side effects were observed during or after the injection of incobotulinumtoxinA into the masseter muscle. To the best of our knowledge, this is the first paper demonstrating the efficacy of incobotulinumtoxinA injections for the long-term management of masseter muscle hypertrophy.

CONFLICT OF INTEREST

The authors state no conflict of interests.

AUTHOR CONTRIBUTIONS

Dr Debraj Shome conceived the study. Dr Sapna Vadera and Dr Rinky Kapoor wrote the manuscript. M Shiva Ram performed statistics.

ORCID

Debraj Shome  <https://orcid.org/0000-0003-2163-1170>

Sapna Vadera  <https://orcid.org/0000-0001-9221-5006>

Rinky Kapoor  <https://orcid.org/0000-0003-1513-0265>

REFERENCES

1. Ahn J, Horn C, Blitzer A. Botulinum toxin for masseter reduction in Asian patients. *Arch Facial Plast Surg*. 2004;6:188-191.
2. Chang CS, Bergeron L, Yu CC, Chen PK, Chen YR. Mandible changes evaluated by computed tomography following Botulinum Toxin A injections in square-faced patients. *Aesthetic Plast Surg*. 2011;35:452-455.
3. Kern AB. Masseter muscle hypertrophy. *AMA Arch Dermatol Syphilol*. 1954;69:558-562.
4. Shome D, Khare S, Kapoor R. Efficacy of botulinum toxin in treating Asian indian patients with masseter hypertrophy: a 4-year follow-up study. *Plast Reconstr Surg*. 2019;144:390e-396e.
5. Shome D, Vadera S, Kapoor R. Efficacy of botulinum toxin in treating Asian Indian patients with masseter hypertrophy: a 4-year follow-up study. *Plast Reconstr Surg*. 2020;145(6):1105e-1106e.
6. Xeomin (Package Insert), Germany Merz Pvt Ltd: 2015.
7. Shome D, Kapoor R, Khare S. Two different types of botulinum toxins: is there a difference in efficacy and longevity? *J Cosmet Dermatol*. 2019;18(6):1635-1641.
8. Comella CL, Jankovic J, Truong DD, Hanschmann A, Grafe S, XEOMIN Cervical Dystonia Study Group. Efficacy and safety of incobotulinumtoxinA (NT 201, XEOMIN[®], botulinum neurotoxin type

- A, without accessory proteins) in patients with cervical dystonia. *J Neurol Sci.* 2011;308:103-109.
9. Dressler D. Five-year experience with incobotulinumtoxinA (Xeomin®): the first botulinum toxin drug free of complexing proteins. *Eur J Neurol.* 2012;19(3):385-389.
 10. Nikolis A, Enright KM, Masouri S, Bernstein S, Antoniou C. Prospective evaluation of incobotulinumtoxinA in the management of the masseter using two different injection techniques. *Clin Cosmet Investig Dermatol.* 2018;11:347.
 11. Baş B, Ozan B, Muğlali M, Çelebi N. Treatment of masseteric hypertrophy with botulinum toxin: a report of two cases. *Med. Oral Patol Oral Y Ciriğia Bucal.* 2010;15:e649-e652.
 12. Kebede B, Megersa S. Idiopathic masseter muscle hypertrophy. *Ethiop J Health Sci.* 2011;21(3):209-212.
 13. Shome D, Nair AG, Kapoor R, Jain V. Botulinum toxin A: is it really that fragile a molecule? *Dermatol Surg.* 2010;36:2106-2110.
 14. Montal M. Botulinum neurotoxin: a marvel of protein design. *Annu Rev Biochem.* 2010;79:591-617.
 15. Kersch M, Roll S, Becker A, Wigger-Alberti W. Comparison of the spread of three botulinum toxin type A preparations. *Arch Dermatol Res.* 2012;304:155-161.
 16. Fang PK, Raphael BH, Maslanka SE, Cai S, Singh BR. Analysis of genomic differences among *Clostridium botulinum* type A1 strains. *BMC Genom.* 2010;11:725.
 17. Matarasso SL. Comparison of botulinum toxin types A and B: a bilateral and double-blind randomized evaluation in the treatment of canthal rhytides. *Dermatol Surg.* 2003;29:7-13.
 18. Panjwani N, O'Keefe R, Pickett A. Biochemical, functional and potency characteristics of type A botulinum toxin in clinical use. *Botulinum J.* 2008;1:153-166.
 19. Ahn KY, Kim ST. The change of maximum bite force after botulinum toxin type A injection for treating masseteric hypertrophy. *Plast Reconstr Surg.* 2007;120:1662-1666.
 20. von Lindern JJ, Niederhagen B, Appel T, Bergé S, Reich RH. Type A botulinum toxin for the treatment of hypertrophy of the masseter and temporal muscles: an alternative treatment. *Plast Reconstr Surg.* 2001;107:327-332.
 21. Klein FH, Brenner FM, Sato MS, Robert FM, Helmer KA. Lower facial remodeling with botulinum toxin type A for the treatment of masseter hypertrophy. *An Bras Dermatol.* 2014;89:878-884.
 22. Kim NH, Park RH, Park JB. Botulinum toxin type A for the treatment of hypertrophy of the masseter muscle. *Plast Reconstr Surg.* 2010;125:1693-1705.
 23. Kim HJ, Yum KW, Lee SS, Heo MS, Seo K. Effects of botulinum toxin type A on bilateral masseteric hypertrophy evaluated with computed tomographic measurement. *Dermatol Surg.* 2003;29:484-489.
 24. Yu CC, Chen PK, Chen YR. Botulinum toxin A for lower facial contouring: a prospective study. *Aesthetic Plast Surg.* 2007;31:445-451.
 25. Scaglione F. Conversion ratio between Botox®, Dysport®, and Xeomin® in clinical practice. *Toxins.* 2016;8:65.
 26. Lee JH, Park JH, Lee SK, et al. Efficacy and safety of incobotulinum toxin A in periocular rhytides and masseteric hypertrophy: side-by-side comparison with onabotulinum toxin A. *J Dermatolog Treat.* 2014;25:326-330.
 27. Moon YM, Kim MK, Kim SG, Kim TW. Apoptotic action of botulinum toxin on masseter muscle in rats: early and late changes in the expression of molecular markers. *Springer Plus.* 2016;5:991.
 28. Borodic GE, Ferrante R, Pearce LB, Smith K. Histologic assessment muscle fiber response of dose-related diffusion and after therapeutic botulinum A toxin injections. *Mov Disord.* 1994;1:31-39.
 29. Grünheid T, Langenbach GEJ, Korfage JAM, Zentner A, van Eijden TMGJ. The adaptive response of jaw muscles to varying functional demands. *Eur J Orthod.* 2009;31:596-612.
 30. Gaofeng L, Jun T, Bo P, Bosheng Z, Qian Z, Dongping L. Evaluation and selecting indications for the treatment of improving facial morphology by masseteric injection of botulinum toxin type A. *J Plastic Reconstr Aesthet Surg.* 2010;63:2026-2031.
 31. Shome D, Vadera S, Khare S, Ram MS, Ayyar A, Kapoor R, Desai N. Aging and the Indian face: an analytical study of aging in the Asian Indian face. *Plastic and Reconstructive Surgery Global Open.* 2020;3:1-12.
 32. Kapoor R, Shome D, Jain V, Dikshit R. Facial rejuvenation after intradermal botulinum toxin: is it really the botulinum toxin or is it the pricks?. *Dermatologic surgery.* 2010;36:2098-105.

How to cite this article: Shome D, Vadera S, Shiva Ram M, Kapoor R. Efficacy of Incobotulinum toxin-A for the treatment of masseter muscle hypertrophy in Asian Indian patients: A 2-year follow-up study. *J Cosmet Dermatol.* 2020;00:1-8. <https://doi.org/10.1111/jocd.13552>