

# Bilateral hypertrophy of masseteric and temporalis muscles, our fifteen patients and review of literature

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**Abstract. – OBJECTIVE:** The association of bilateral hypertrophy of temporalis and masseteric muscles is a rare clinical entity. The origin of the condition is unclear, causing cosmetic problems, pain, and functional impairment.

**PATIENTS AND METHODS:** In this paper we analyzed 15 patients treated at the Department of Maxillo-Facial Surgery of the University of Naples Federico II, from 2000 to 2013, for temporalis and/or masseteric muscle hypertrophy, and in particular, a rare case of a patient with a marked bilateral swelling of the temporalis and masseteric region, in conjunction with a review of the literature.

**RESULTS:** Fourteen patients have not any kind of postoperatively problems. The last patient had been aware of the swelling for many years and complained of recurrent headaches. We adopted a new protocol for these patients and the patient was very pleased with the treatment results, and reported a reduction in headaches and a continuation of his well-being, in addition to greater self-confidence. The last follow-up was performed three years after the first treatment, and the patient showed a complete resolution of his symptoms, and just a small increase of the swelling.

**CONCLUSIONS:** The treatment of temporalis and masseteric hypertrophy with Botulin toxin could be an effective option compared to conservative treatment or surgical intervention although the review of the literature shows that this is only a temporary treatment. In fact, surgery still remains the best option.

The treatment must be repeated every 4/6 months for 2-3 consecutive years before having stable benefits. To overcome this problem, an association with a bite treatment allowed us to achieve more lasting and more stable results over time without a recurrence of symptoms between the treatments. Furthermore, this association has enabled us to obtain a more rapid reduction of the hypertrophy.

*Key Words:*

Botox, Bite, Temporalis and masseteric muscle hypertrophy.

## Introduction

The association between bilateral hypertrophy of temporalis and masseteric muscles is a rare clinical entity and only few cases have been reported in the literature. This phenomenon was first described by Legg in 1880<sup>1</sup> and well detailed by Dencer and Franks<sup>2-3</sup>. Temporalis and masseteric muscle hypertrophy is regarded as reactive in nature, but may be also idiopathic. It occurs most commonly between the ages of 20 and 40 and is not gender-specific. Mandibular retrognathia and masticatory muscle hyperactivity have been described as possible causes<sup>3</sup>. The origin of the condition is unclear because masticatory muscle hyperactivity or parafunctions and dysfunctions in the stomatognathic system, cannot be verified in all instances of hypertrophy. Compensatory and stress hypertrophy has been assumed in most cases<sup>4</sup>. Changes in the proprioceptors have also been discussed<sup>5</sup>.

From the clinical and anamnestic point of view, attention has focused on the aesthetic aspect of the unilateral or bilateral hypertrophy, because of the distension in the mandibular angle region. At the same time, the symptoms have shown to be compounded by local pain and functional impairments. In the past, the treatment of choice for correcting the hypertrophy of these muscles in the maxillofacial region was surgical reduction, and attention was focused not only on the general risks associated with the operations,

but also on the risk of damaging the facial nerve<sup>6,7</sup>. Therefore, medical management utilizing botulinum toxin A, has become the treatment of choice and has been successfully used to correct temporalis and masseteric hypertrophy.

### Materials and Methods

We analyzed 15 patients treated at the Department of Maxillo-Facial Surgery of the University of Naples Federico II, from 2000 to 2013, for temporalis and/or masseteric muscle hypertrophy, and we describe a rare case of a 29 y.o. male patient with marked bilateral swelling of the temporalis and masseteric region.

Four patients had monolateral masseteric hypertrophy, two patients had monolateral temporalis muscle hypertrophy, three patients showed homolateral masseteric and temporalis muscle hypertrophy, while five patients had bilateral masseteric muscle hypertrophy.

Only one patient with bilateral masseteric and temporalis muscle hypertrophy was observed.

Five patients were treated by surgical reduction of the muscles. Ten patients were treated by injection of Botulin toxin type A.

### Results

Fourteen patients have not any kind of postoperatively problems. The last patient had been aware of the swelling for many years and complained of recurrent headaches. The muscle bulk was more prominent when the patient clenched his teeth. There was no evidence of bruxism. His clinical history began when he was 19 years old and he noticed a swelling of the right masseteric region (Figure 1). About three years later he reported a bilateral swelling of the masseteric region and at the age of 27 also a swelling of the temporalis region bilaterally (Figure 2).

His orthopantomogram revealed no abnormalities. An electromyography detected massive muscle activity especially during chewing. An ultrasound examination of the masseteric and temporal regions was performed, and it revealed no abnormalities of the muscles. A diagnosis of bilateral masseteric and temporalis muscle hypertrophy was suggested, so no organic abnormality was found. A careful analysis of the patient's medical history revealed deep social problems of the patient in adolescence due to difficult



**Figure 1.** Patient before the onset of temporal and masseteric hypertrophy.

relationships with the female sex. In this regard, the patient's friends reported that when they were in a group together with attractive girls, he clenched his teeth and stammered. This discomfort lasted for a few years and probably altered the strength of the masseter muscle of the patient and perhaps there had been a clearing of all the other muscles involved in chewing.

Treatment was carried out by percutaneous injection of a total of 100 Units of botox, into the temporalis and masseteric muscles bilaterally,



**Figure 2.** Patient before the treatment.

combined with the use of a rigid upper bite for muscle stabilization. This dose was chosen after several attempts made with lower and increasing doses in patients with the same type of disease but for different causes and with poor results. Our first patient treated with injection of Botulin toxin received 12 UI of Botox in the masseteric muscle, but his symptoms reappeared after 2 months. We increased the doses of 4 UI every 4/5 months, in order to obtain a more stable result, until a dose of 30 UI for each muscle was injected.

We adopted a new protocol performed on the last patient: for the temporalis muscle, 20 UI of toxin each side were placed relatively deep within the muscle mass at several sites to take account of the anatomy of the deep temporal nerves, which normally enter more deeply into the muscle. Therefore, we injected the toxin superficially. We marked the temporal artery on the ultrasound, and we highlighted three points between the artery branches where the muscle thickness is greater. For the masseteric muscle we defined a rectangular safety injection zone within four lines (Figure 3). We drew the first line linking the ear lobe and the mouth corner, the second line along the mandible angle and the two vertical lines marked the anterior and posterior margins of the masseter muscle by palpation. This was considered the safety zone because there are no important anatomical structures under the mouth corner/ear lobe line and because it was the area with the greatest thickness of the



**Figure 3.** Infiltration points.

masseteric muscle. Within this rectangle we injected 30 UI for each side at three points, taking into consideration the possible diffusion of the toxin. The follow-up was arranged four weeks and eight weeks postoperatively. At the later checkup the muscle contour had returned to normal. The treatment was repeated every 6 months. The ultrasound showed, after 2 years of treatment, a reduction in muscle thickness from 215 mm to 150 mm of masseteric muscle and from 160 mm to 90 mm of temporalis muscle. The electromyography performed after two years detected a reduction of the muscular activity both at rest and during maximum activity.

The patient was very pleased with the treatment results, and reported a reduction in headaches and a continuation of his well-being, in addition to greater self-confidence.

The last follow-up was performed three years after the first treatment (one year after the last treatment), and the patient showed a complete resolution of his symptoms, and just a small increase of the swelling (Figure 4) Therefore, we decided to discontinue injection therapy but just bite therapy during the night. To date the patient has not deemed it necessary to carry out additional checkups because by phone he reports being well.



**Figure 4.** Patient after 18 months of treatment. Stable result after 2 years.

## Discussion

Masseteric and temporalis muscle hypertrophy is an uncommon clinical condition of uncertain etiology. The hypertrophy can be unilateral or bilateral, affecting both males and females, but has a slight male predominance. Since 1880, when Legg<sup>1</sup> reported the first case of bilateral hypertrophy of the masseter and temporal muscle in a 10 y.o. girl, to our knowledge, 130 other cases of masseteric or temporalis hypertrophy have been described in the pertinent literature. This is a rare clinical entity and several theories have been proposed regarding the etiology, and its specific cause has not yet been well clarified. Temporalis and masseteric muscle hypertrophy is regarded as reactive in nature, but may be also idiopathic. Mandibular retrognathia and masticatory muscle hyperactivity have been described as possible causes. The origin of the condition is unclear because masticatory muscle hyperactivity or parafunctions and dysfunctions in the stomatognathic system cannot be verified in all instances of hypertrophy. Compensatory and stress hypertrophy has been assumed in most cases<sup>3</sup>. Changes in the proprioceptors have also been discussed<sup>4</sup>.

It can be associated with facial pain and can be prominent enough to be considered cosmetically disfiguring. This clinical condition can be treated by partial surgical resectioning of the masseteric and mandibular angle, or temporalis muscle performed by an intraoral or extraoral approach, or with conservative treatment using botulinum toxin type A injection. In our case load, from 2000 to 2013, fifteen patients were treated. Four patients had monolateral masseteric hypertrophy, two patients had monolateral temporalis muscle hypertrophy, three patients showed homolateral masseteric and temporalis muscle hypertrophy, five patients had bilateral masseteric muscle hypertrophy, and only one patient with bilateral masseteric and temporalis muscle hypertrophy was observed.

Five patients were treated by surgical reduction of the muscle, ten patients were treated with injection of Botulin toxin type A, and one with the association of Botulinum toxin type A injections, and a bite.

Injection of botulinum toxin type A into the masseter muscle was first introduced by Smyth<sup>8</sup>, Moore and Wood<sup>9</sup> in 1994 and was considered a less invasive procedure for cosmetic sculpting of the lower face. Botulinum toxin type A injection

is reported to be a safe and effective treatment in some pathologies, such as orofacial dystonies, sialorrhea, Frey's syndrome, and muscle hypertrophies<sup>10-12</sup>.

Injection of botulinum toxin type A into the muscles is generally considered a less invasive procedure and has been advocated for cosmetic sculpting of the face. Botulinum toxin type A is a powerful neurotoxin which is produced by the anaerobic organism *Clostridium botulinum* and when injected into a muscle causes interference with the neurotransmitter mechanism, producing selective paralysis and subsequent atrophy of the muscle.

The possible complications of this procedure are external scarring, damage to the mandibular or temporal branches of the facial nerve, change in bite strength, speech disturbance, muscle pain, facial asymmetry, and prominent zygoma. Perhaps the biggest limitation of botulinum toxin therapy is that the effects of treatment wear off within 6 months and the original pathological condition returns. Many cases of masseteric muscle hypertrophy are described in the literature, but, to our knowledge, only three cases with association of masseteric and temporalis hypertrophy<sup>13-15</sup>, and no cases of a progressive hypertrophy, like in our case, have been reported.

This case suggests that the treatment of temporal and masseteric hypertrophy with Botox could be an effective option compared to conservative treatment or surgical intervention, where the muscle bulk is disfiguring. Although Botox is expensive, intramuscular injection can be performed in the outpatient clinic and costs compare favourably to surgical costs.

The patient need not be hospitalized and can return to normal activity immediately. Moreover the patient far more willingly accepts this type of treatment without pain or the presence of unsightly scars. Furthermore, the final result is satisfactory and improves the quality of life of the patient. The only problem is that treatment must be repeated every 4/6 months for consecutive 2-3 years before having stable benefits. In actual fact initially, 2-3 months after the treatment, patients, as reported in literature, have a gradual recurrence of the symptoms. To overcome this problem, we used a bite in association with botox treatment. This association allowed us to achieve more lasting and stable results over time without a recurrence of symptoms between treatments. Furthermore, this association has enabled us to obtain a more rapid reduction of the hypertrophy.

## Conclusions

Masseter and temporalis hypertrophy is a benign condition with variable causative factors, such as bruxism, temporomandibular disorders, malocclusion and others, but has an unclear etiology in the majority of cases. There are theories described in literature, and also progressive hypertrophy caused by episodes of anxiety in the relationship with the opposite sex. It can be associated with facial pain and asymmetry. The treatment of temporal and masseteric hypertrophy with Botox could be an effective option compared to conservative treatment or surgical intervention, where the muscle bulk is disfiguring. An optimal treatment is carried out by percutaneous injection of 100 UI of botox into the temporalis and masseteric muscles bilaterally, combined with the use of a bite for muscle stabilization. For the temporalis muscle 20 UI of toxin each side are adequate to solve the hypertrophy, to be placed relatively superficially.

For the masseteric muscle 30 UI for each side at three points into a rectangular safety injection zone are the best solution. The follow-up is fundamental at four weeks and eight weeks postoperatively. The treatment is repeated every 6 months.

With the association of injection of Botulin toxin type A and a rigid upper bite we can obtain an increase of the duration of the results and a longer stability in time.

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## Conflict of Interest

The Authors declare that they have no conflict of interests.

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