J Oral Med Oral Surg 2022;28:38
https://doi.org/10.1051/mbcb/2022022

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JOMOS
Journal of Oral Medicine and Oral Surgery

Case Report

Masticatory muscle tendon-aponeurosis hyperplasia: clinical presentation and management

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(Received: 29 March 2022, accepted: 6 July 2022)

Keywords: Botulinum toxin / CBCT / mandibular angle / masseter muscle hypertrophy / osteotomy

Abstract – Introduction: Masseter muscle enlargement accompanied by hypertrophy of Mandibular angle can significantly affect the appearance and quality of life. The treatment methods can be varied, and, in the present study, osteotomy of Mandibular angle and treatment of Masseter muscle with Botulinum toxin was carried out. **Observation:** In this case study, a 19-year-old female patient was admitted with inadequate mouth opening for three years. Clinical examination and Cone-Beam Computed Tomography scan revealed bilateral well-developed Masseter muscles and hypertrophy of mandibular angle on both sides. Osteotomy of mandibular angle was performed. Additionally, 25 units of Botulinum toxin were administered. This improved the aesthetic appearance and increased the mouth opening from 21 mm to 38 mm in one year after surgery. **Conclusion:** Oral and maxillofacial surgeons should consider Masticatory muscle tendon-aponeurosis hyperplasia as a differential diagnosis when the patient's chief complaint is inadequate mouth-opening with a square mandible. Osteotomy of mandibular angle in conjunction with, Botulinum toxin is efficient in cases of Masseter muscle hypertrophy and an enlargement of the Mandibular angle.

Introduction

Masseter muscle hypertrophy is associated with enlargement of Masseter muscles as well as flaring of the mandibular angle. It not only impacts the aesthetics, but also functionality by limiting the opening of mouth [1]. Restricted mouth opening can be due to temporomandibular disorders, fracture of the condylar process, neurological disorders, rheumatoid arthritis, inflammation, tumours or hyperplasia of the coronoid process. Masticatory muscle tendon-aponeurosis hyperplasia (MMTAH) is a different clinical complaint associated with partial mouth opening [2]. Prominent mandibular angle in Orientals has also been attributed to lateral flaring as well as the development of the posterior part of the angle of the mandible instead of Masseter muscle hypertrophy [3]. The diagnostic measures for MMTAH are either limited mouth opening that progresses very slowly from adolescence, and no limitation of lateral or anterior mandibular movement or intraoral palpation reveals a hard cord-like structure along the overhang of the anterior border of the masseter muscle on maximum mouth opening. Although MRI can help visualize tendons and aponeuroses, the criteria for diagnosing hyperplasia in these tissues have not been well elucidated.

Though several conditions like Bruxism, Temporal Mandibular Joint (TMJ) disorders, clenching, and malocclusion have been implicated in causing this condition, the actual reason is still not clear. Diagnosis involves physical and clinical examination as well as imaging methods like computed tomography scan [4]. Conventional management, including mouth opening training, has shown no significant effects. Surgical treatment options include aponeurectomy of the masseter muscle with coronoidectomy. Yoda *et al.* reported of satisfactory outcome on surgical intervention of 10 MMTAH patient [5]. Although mandibular anglectomy or masseter muscle myotomy improves restricted mouth opening temporarily, good long-term results have not been obtained. Murakami *et al.* suggested that mandibular anglectomy was necessary to release the muscle sling of the medial pterygoid and masseter muscles [6]. Aponeurectomy of the masseter muscle relieves tension in this muscle. Mandibular anglectomy is unnecessary but can still be performed for esthetic reasons. Yoshida *et al.* also reported that they sometimes carry out mandibular anglectomy for a square mandible and suggested that mandibular anglectomy induces disuse atrophy of the masseter and medial pterygoid muscles [7]. These recurrent cases often cause limitations in mouth opening. Thus, most of these cases required another surgical operation [8–10].

Other methods of treatment of masseter muscle hypertrophy and enlargement of bony part of Mandibular angle include surgical treatments like osteotomy and masseter muscle

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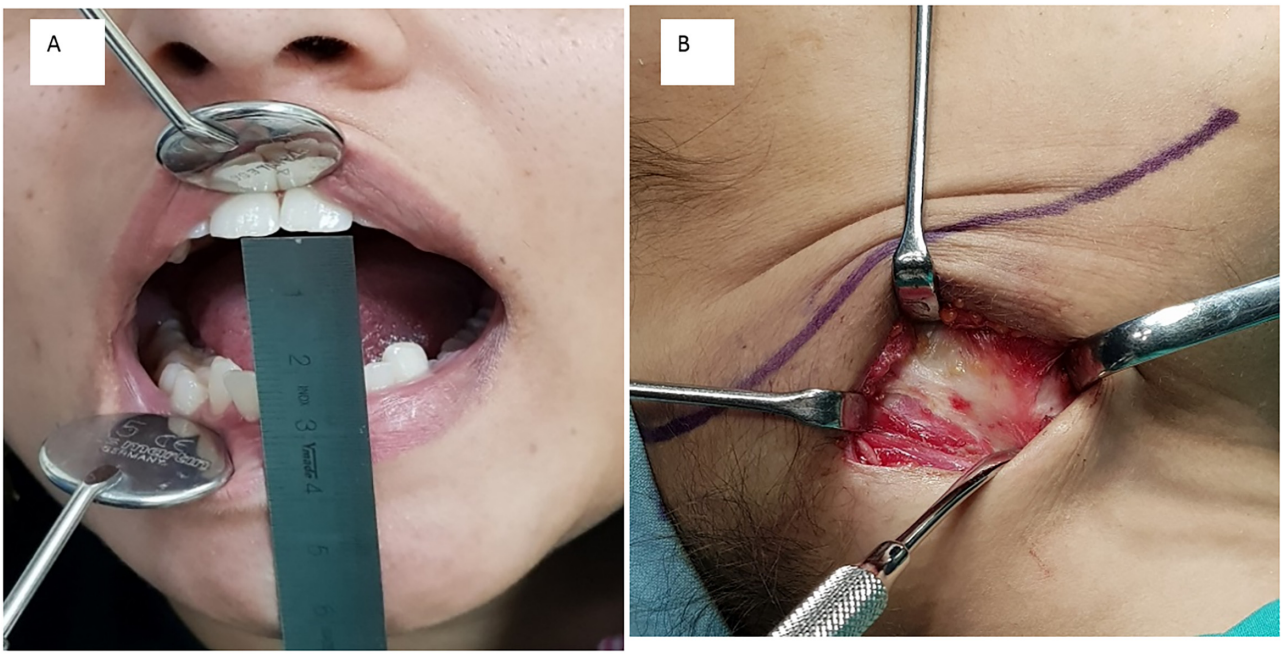

Fig. 1. Pre operative conditions. A: Limited mouth opening of 21 mm; B: Aponeurosis of masseteric muscle.

excision, but recent studies have reported the use of Botulinum toxin for controlling hypertrophy of muscle [4]. Several authors like Von Linden *et al.* reported the efficacy of Botulinum toxin in the successful atrophy of Masseter muscle [11]. Administration of Botulinum toxin into masseter muscle causes selective paralysis resulting in atrophy, which was demonstrated by its successful use in treating Masseter hypertrophy [12]. The present case deals with the effective management of a patient with bilateral enlargement of the masseter muscle and hypertrophy of the mandibular angle, with the help of osteotomy as well as administration of Botulinum toxin.

Observation

Patient history and diagnosis

A female patient, 19 years old, whose major symptom was limited opening of the mouth for three years and unpleasant jaw shape, was subjected to TMJ examination at TMJ clinic of the oral and maxillofacial department of Al Nahada hospital following a referral from the peripheral health centre. She had a prominent square-shaped jaw, and there were no reports of any chronic medical conditions. Informed consent was obtained from the patient prior to investigation and reporting. There was also no history of facial trauma, odontogenic abnormalities or TMJ disorder. Her mother accompanied her.

Clinical investigation revealed a mass (no change in its size was observed) over both mandibular angles. The patient exhibited an unaided maximal mouth opening of 21 mm (Fig. 1A), and midline deviation was not observed during occlusion during surgery. The aponeurosis of the masseteric muscle was observed (Fig. 1B). It was the typical presentation of MMTAH. Pre-operation conditions are shown in Figure 2. The prominence of the mandible angle and bone spur development was detected along with a slight increase in muscle size and tension by the Cone-beam computed Tomography (CBCT) scan. The CBCT scan also showed the presence of well-developed bilateral masseter muscle and hypertrophy of bilateral mandibular angle (Fig. 3).

Treatment procedure

Bilateral angular ostectomy under general anaesthesia was performed with the patient's informed written consent. The mandible (lower border of the mandible body and angle) was marked, and the references were identified. Infiltration of lidocaine with adrenaline (1:80,000) was administered. A submandibular incision was made along the skin and subcutaneous layers, followed by an incision of platysma layers (encountering the marginal mandibular nerve and retromandibular vein). The incision continued through the pterygomasseteric sling and masseteric muscle towards the bone. A periosteal elevator was then used to degloving periosteum till the ramus. Demarcation of reference was done, and the angle of the mandible was cut using a piezoelectrical machine, releasing lingula attachment periosteum and muscle. The osteomatised bone was then sent for a histopathology examination. 25 units of Botulinum toxin were administered in the masseter muscle. Closure of layers of masseter, platysma and subcutaneous tissue was done with Vicryl 3-0, and skin closure was done with Nylon 5-0. This procedure was carried out on both sides.

Histopathology report

The histopathological exam reported unremarkable bone and skeletal muscle as expected in cases of hyperplasia from both left and right mandibular osteomatised bone. No atypia was observed microscopically in both oral cavity samples.

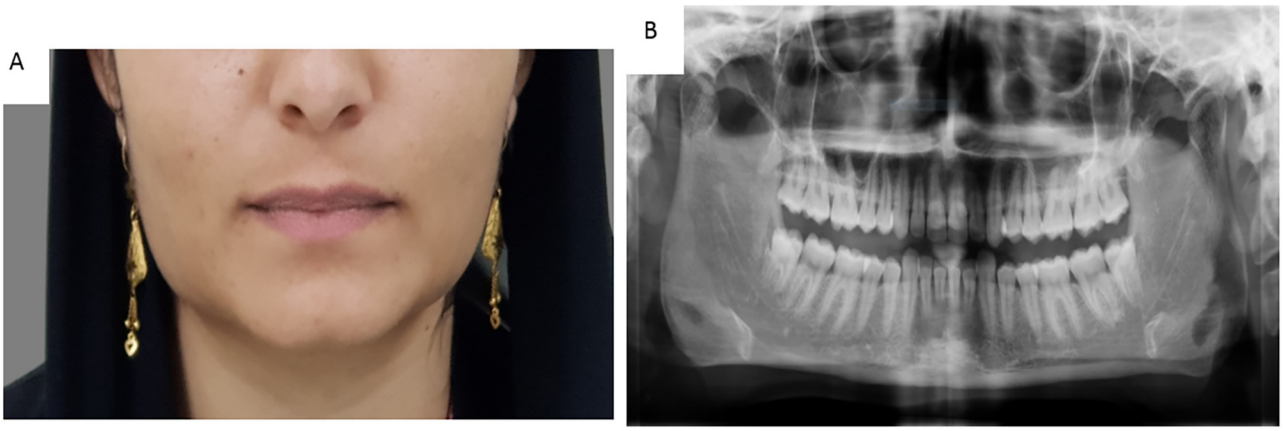

Fig. 2. Pre operation condition. A: Prominence of mandibular angle; B: Pre-operative OPG.

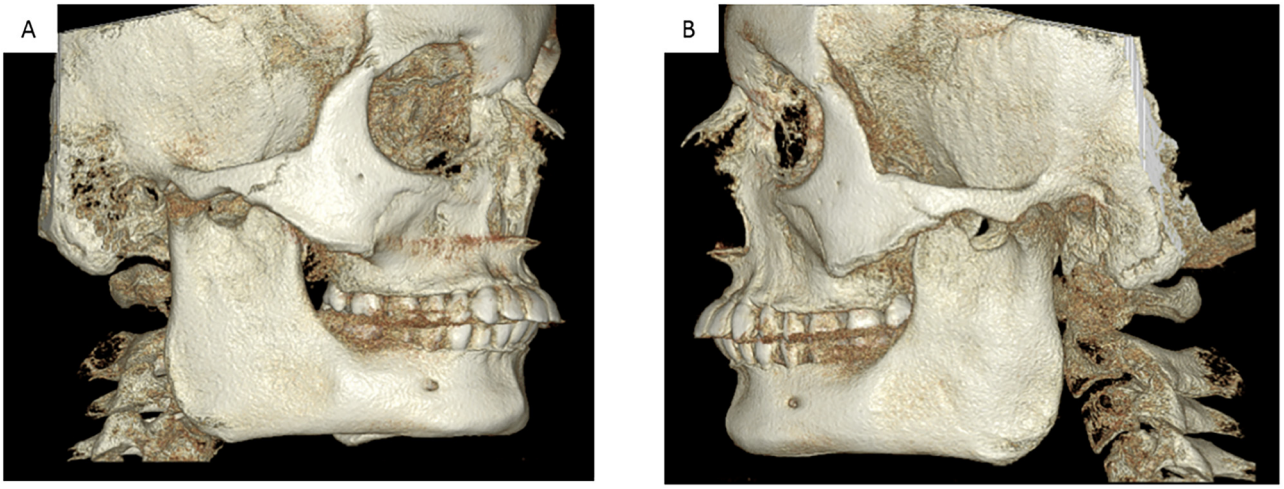

Fig. 3. 3D CBCT showed bilateral hypertrophy of mandibular angle.

Postoperative treatment and outcome

The patient was followed up once a week for three consecutive months, after which the follow up was carried out monthly till she completely recovered. Recovery post-surgery for the patient took six months. A mouth opening of 23 mm in the patient was observed within a week of the postoperative period. Hence, the patient was prescribed physiotherapy using a wooden spatula and Amitriptyline (25 mg) for 30 days, which act as adjunct helping in long term muscle activities, allowing postoperative exercise. Within a month of the postoperative period, the patient's mouth opening was 26 mm, which increased to 36mm within a year. Postoperative results are shown in Figure 4.

The submandibular approach risks injuring the mandible marginal mandibular nerve, vessel injury, and scarring. We had an excellent accessibility site, and we did not encounter any never injury, bleeding or scarring.

Quality of life

Mandibular angle Osteotomy affected the patient's quality of life significantly. It increased the patient's mouth opening and enhanced the lower facial appearance. The patient's diet improved from a soft diet to a normal one resulting in a considerable improvement in the patient's quality of life. Serial radiographic examination depicted satisfactory bone remodelling at the angle of the mandible with no hypertrophy of the bone or the muscle. One year post-operation with normal appearance of mandibular angle (Fig. 5).

Discussion

MMTAH is another clinical condition that presents mainly with trismus due to hyperplasia of the masseter aponeurosis and temporalis muscle tendon, and it is often mistreated as TMJ. The etiological factors of this disease are unknown [13].

Masseter muscle hypertrophy accompanied by prominent mandibular angle may be caused by bruxism, malocclusion or other causes yet undefined. Several studies have reported the use of surgery for the reduction of the prominent mandibular angle. For example, Nishida and Iizuka reported successful treatment by masseter muscle and intraoral removal of mandibular angle [1].

The standard remedy is surgical interventional only, including anterior partial aponeurectomy of the masseter muscle and coronoidectomy. Coronoidectomy is performed to remove the

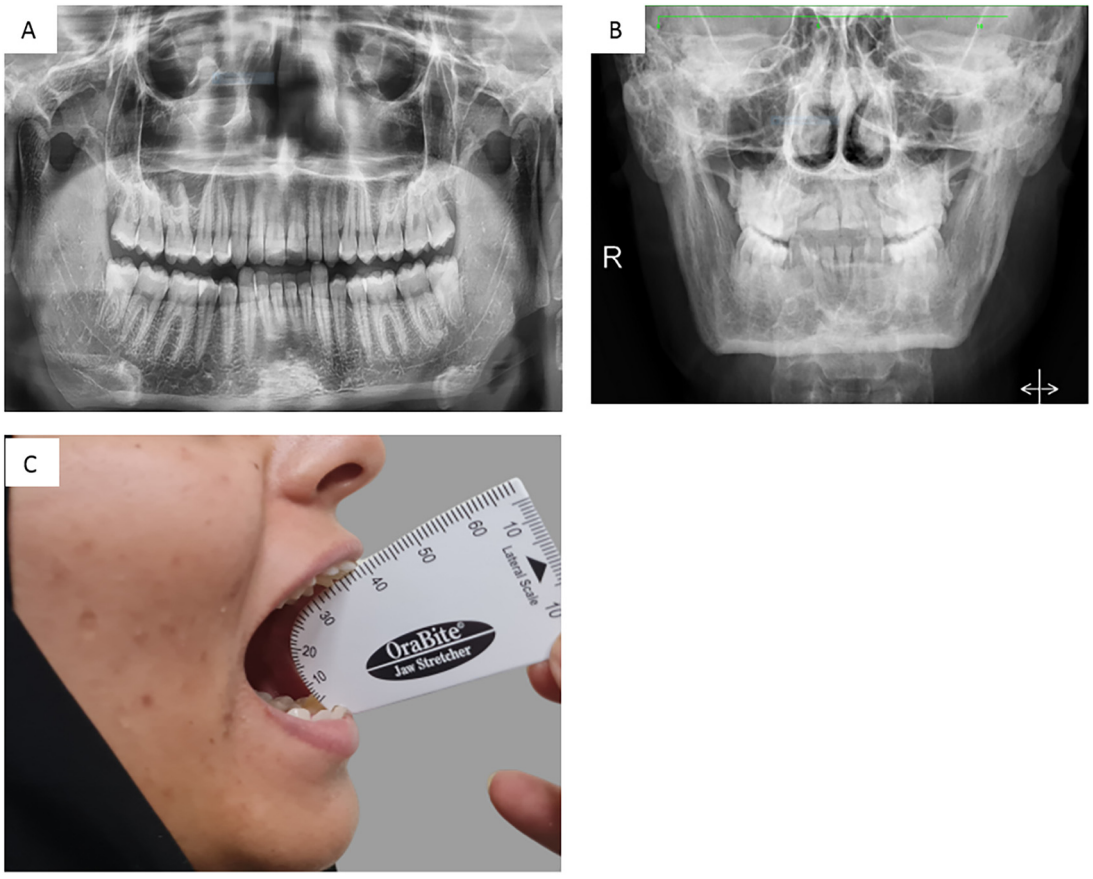

Fig. 4. One year postoperative results. A: Postoperative OPG; B: Postoperative PA; C: Mouth opening of 36 mm.

Fig. 5. One year post operation with normal appearance of mandibular angle.

tendon arising from the posterior and superior aspects of the coronoid process. Although mandibular anglectomy is also known according to Yoda *et al.*, it is unnecessary to improve the limited mouth opening [2]. However, mandibular anglectomy can still be performed for aesthetic reasons. Surgical treatment is performed under general anaesthesia. Muscular relaxation does not improve the restricted mouth opening.

Masseter muscle hypertrophy combined with limited mouth opening along with hypertrophy of mandibular angle was associated with MMATH [14]. It is clear cases of MMATH, with typical symptoms, condition progressed very slowly from adolescence, patients have few subjective symptoms, usually have no pain in the region of the temporomandibular joint or muscles, and the lateral and anterior movements of the mandible are not limited and feature of this disease is a square mandible with a small gonial angle and flattening of the occlusal plane.

The present case study also showed similar features. Recent studies have established the efficacy of Botulinum toxin as opposed to resection of masseter Muscle for safe and non-invasive treatment of the Masseter hypertrophy [13,15]. The present study also proved the efficacy of Botulinum Toxin in Masseter Hypertrophy. Enlargement of mandibular angle observed in the patient was treated by Mandibular Angle Ostectomy. It is one of the most popular methods employed for the correction of prominent Mandibular angles.

We studied a case of masseter muscle enlargement combined with bilateral hypertrophy of Mandibular angle. The patient complained of limited mouth opening for the past three years. Diagnosis involved CBCT scanning, which revealed the presence of hypertrophy of Mandibular angle as well as well-developed Masseter muscle. This condition was successfully reversed by the use of Botulinum toxin and Mandibular angle Osteotomy. This treatment increased the mouth opening of the patient and enhanced the patient's aesthetic appearance and quality of life.

Conclusion

Osteotomy of Mandibular angle and use of Botulinum toxin can be employed for successful handling of cases with Masseter muscle hypertrophy accompanied by hypertrophy of mandibular angle.

Authors contributions

Ahmed Al Qattan: Conceptualization, Methodology, drafted the manuscript, Ahmed Al Hashmi: Writing original draft,fallow-up with the patient, Said Al Rashdi: Writing- Reviewing and Editing.

Acknowledgements

Authors would like to acknowledge study participants, who gave conset for the study.

Conflict of interest:

The author Ahmed Al Qattan, Ahmed Al Hashmi, Said Al Rashdi declare that they have no conflicts of interest in relation to this article.

Informed consent:

The informed conset is obtained from the participant.

Ethical committee approval:

Institution ethical approval was obtained for the work.

Source of funding:

The authors have not declared a specific grant for this research from any funding agency in public, or commercial sectors.

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