

**Title:** New ultrasonography application: masseter muscle examination

**Author:** Associate Professor Fouzi BOUKHAZANI

Faculty of medicine of Algiers

### **Abstract**

The human masseter is a symmetric muscle known to be a strong elevator muscle of the lower jaw. The actual study aims to check the applicability of ultrasound imaging for the masseter to facilitate diagnosis and treatment for clinicians working on this part of the human body.

91 Patients, aged from 8 to 12 years old, participated in this study in which an ultrasonography was accomplished. At the end of this study, all the young patients were examined without any issue. The deep plane was easily distinguished in 98.90% of the participants while the superficial plane was visible in 87.91% of the participants. The different layers were visible in 95.60% in the contraction examination compared to 84.61% in the rest examination.

The viability of ultrasonography of masseter has been reported by authors. Bakke et al. in 1992 considered that ultrasound scanning gave an uncomplicated and reproducible access to parameters of jaw muscle function. The findings of the current study confirm that ultrasonography can be employed to evaluate the thickness of masseters with acceptable reliability.

In conclusion, the introduction of ultrasonography in masticatory muscle imaging can be a real breakthrough in diagnosis and treatment techniques used by clinicians.

**Keywords:** masseter, ultrasonography, jaw muscle.

### **I. Introduction**

The human masseter is a strong elevator muscle of the mandible against the maxilla. It also plays a small part in protracting the mandible and in lateral movements. The masseter muscle has a special significance for facial aesthetics.

### **II. Anatomy and physiology**

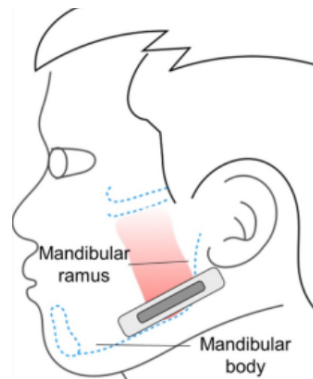
The masseter is described as quadrilateral, and distinguish between a superficial and a deep portion. The superficial part originates by a thick aponeurosis on the temporal process of the zygomatic bone and the inferior side of the zygomatic arch <sup>(1)</sup>. The masseter muscle participates in a wide variety of activities including mastication, swallowing and speech <sup>(2)</sup>.

### **III. Methods**

The actual study aims to check the applicability of a new imaging technique for this muscle to facilitate diagnosis and treatment for clinicians working on this part of the human body.

91 Patients, aged from 8 to 12 years old, participated in this study in which an ultrasonography was accomplished.

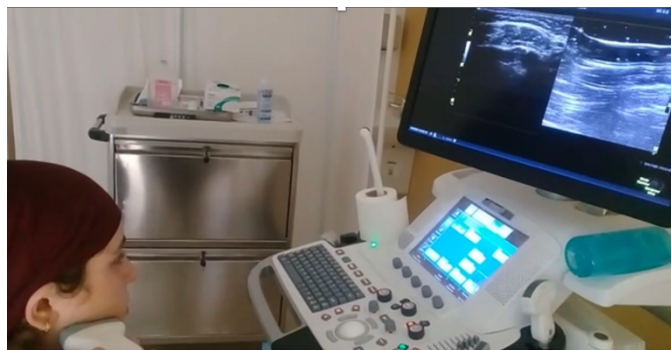
For the examination purposes, linear probe of 12 MHz has been used. The scanned area is shown by Chang et al. in the figure 1 (3).



**Figure 1:** The scanned area as shown by Chang et al. (3).

#### IV. Results

By the end of the study, all the participants have been examined without issue (Fig 2).



**Figure 2:** Examination result for the first participant.

But some quality criteria need to be described.

##### 1. The deep plane

This plane represented by the ramus was easily distinguished in 98.90% of the participants (Fig 3).



**Figure 3:** The masseter ultrasonographic aspect in contraction and at rest. The deep layer and the superficial ones can be easily distinguished.

##### 2. The superficial plane

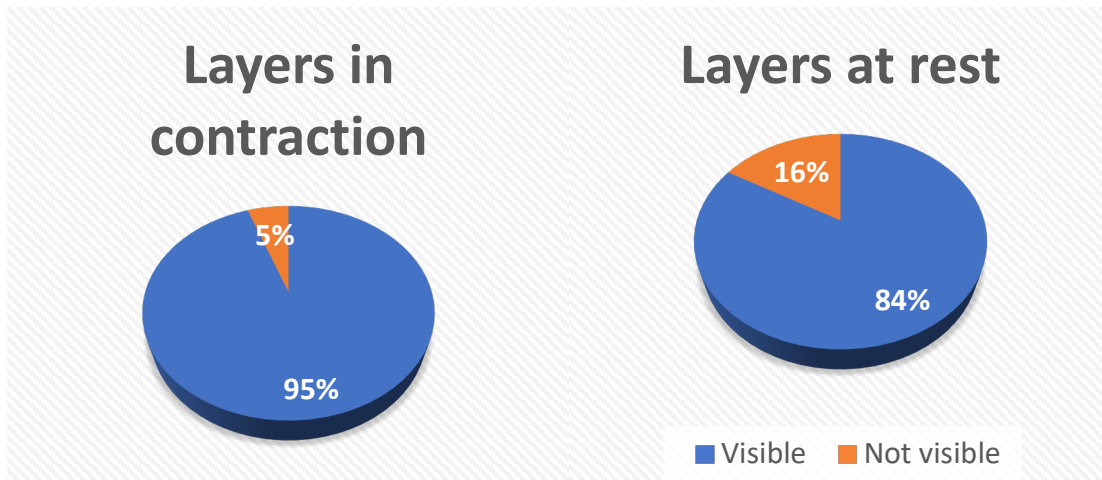
This cutaneous plane was visible in 87.91% of the participants (Fig 3).

### 3. The muscle's layers in contraction

The different layers were visible in 95.60% in the contraction examination (Fig 4).

### 4. The muscle's layers at rest

The different layers were visible in 84.61% at the rest examination (Fig 4).



**Figure 4:** Graphical presentation of the visibility of layers.

## v. Discussion

The viability of ultrasonography of masseter has been reported by authors.

Bakke et al.1992 considered that ultrasound scanning gives an uncomplicated and reproducible access to parameters of jaw muscle function <sup>(4)</sup>. The findings of the current study confirm that ultrasonography can be employed to evaluate the thickness of masseters with acceptable reliability.

But 2 points need to be discussed:

- ✓ The visibility of deep plane better than the superficial one.
- ✓ The visibility of layers in contraction better than at rest position.

First the visibility of deep plane is due to the nature of the tissue, this is represented by the ramus of the mandible <sup>(5)</sup> (bone compared to cutaneous plane)

Secondly, the contraction examination condition increases the muscle' thickness which gives a better view of the muscle layers <sup>(6)</sup>.

## vi. Conclusion

The introduction of ultrasonography in masticatory muscle imaging can be a real breakthrough in diagnosis and treatment techniques used by clinicians. The use of this technique in botulinum toxin injection or for orthodontic purposes can be one of these perspectives.

## References:

1. Mezey SE, Müller-Gerbl M, Toranelli M, Türp JC. The human masseter muscle revisited: First description of its coronoid part. *Annals of Anatomy.* 2022; 240: 1-8.

2. Widmer CG, English AW, Morris-Wiman J. Developmental and functional considerations of masseter muscle partitioning. *Arch Oral Biol.* 2007 Apr;52(4):305-8.
3. Chang PH, Chen YJ, Chang KV. Ultrasound measurements of superficial and deep masticatory muscles in various postures: reliability and influencers. *Sci Rep.* 2020; 10:143-57.
4. Bakke M, Tuxetv A, Vilmann P, Jensen BR, Vilmann A, Toft M. Ultrasound image of human masseter muscle related to bite force, electromyography, facial morphology, and occlusal factors. *European Journal of Oral Sciences.* 1992; 100: 164-171.
5. Spronsen PH van, Weijs WA, Valk J, Prahl-Andersen B. Relationships between jaw muscle cross-sections and skull shape studied with MRI. *Program and abstracts of the 66. Congress of the European Orthodontic Society, Copenhagen* , 1990: 34, Abstr. no. 24.
6. Bae H, Kim J, Seo KK, Hu K-S, Kim S-T, Kim H-J. Comparison between Conventional Blind Injections and Ultrasound-Guided Injections of Botulinum Toxin Type A into the Masseter: A Clinical Trial. *Toxins.* 2020; 12(9):588.