Brief Report

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A Comparison of Ultrasonic Thickness of Masseter Muscle between Patients with Bruxism and Healthy People

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ABSTRACT

BACKGROUND AND OBJECTIVE: Evaluating the thickness of the masseter muscle is an important determinant of the health or illness of the muscle. Investigating changes in masseter muscle thickness due to its function on the temporomandibular joint plays a significant role in detecting the cause of many disorders in this joint. The present study aims to compare the ultrasonic thickness of masseter muscle between patients with bruxism and healthy people.

METHODS: This case-control study was conducted among 44 subjects in two groups (22 subjects in each group of, including 11 women and 11 men) in the age range of 18 – 30 years old in patients with bruxism and healthy people. The subjects had normal BMI, had no inflammatory disease or strike to the temporomandibular joint, and had no history of maxillofacial surgery. Ultrasound evaluation of masseter muscle was performed in a supine position, with 12 MHz linear probe along the auricle and perpendicular to mandibular ramus on muscle ventricle and the thickness of the muscle was obtained in millimeters.

FINDINGS: The masseter muscle thickness was more in patients with bruxism (11.97±0.85 mm) than healthy subjects (10.76±2.2 mm) ($p<0.01$). The masseter muscle thickness in men (12.54±0.4 mm and 11.44±0.25 mm, respectively) was more than that of women (11.4±0.79 mm and 10.08±3.05 mm, respectively) ($p=0.038$).

CONCLUSION: The results of this study showed that the masseter muscle thickness in people with bruxism is more than healthy people and is more in men.

KEY WORDS: *Bruxism, Masseter, Muscle thickness, Ultrasonography.*

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Introduction

One of the problems in patients regarding temporomandibular joint is bruxism. Stress, occlusal disorders, allergies and sleep position are the causes of bruxism (1). A large part of the behavioral causes of bruxism is still unknown and various theories have been proposed to explain it. Psychological factors and stress play a major role in the promotion and continuation of this disease (2).

The prevalence of the disease includes 5% to 8% of the adult population. The prevalence of this disease is low in North America and in European countries, but is higher in Asian populations (3, 4). The bruxism causes several physical and mental problems. Disorders associated with bruxism include insomnia, headache, morning muscle stiffness, paranasal sinus disorders(5), temporomandibular joint disorders, tenderness and hypertrophy of the masseter (6). Liao reported that insomnia syndrome, respiratory problems and snoring are associated with bruxism (7). Fernandes et al. in a study among 272 people who suffered either from temporomandibular joint disorder or bruxism or both of them, stated that bruxism is a risk factor for temporomandibular joint disorder, which in turn is a risk factor for depression (8). Raphael et al. evaluated the validity and reliability of a person's report of a bruxism during bedtime in patients with temporomandibular disorders and healthy subjects, which showed that bruxism report by an individual is not a valid indicator for the presence of bruxism (9).

In a case study, Aruzal et al. evaluated a 29–year–old young man with asymmetrical swelling of jaw muscles, and the examination showed bilateral hypertrophy of right temporalis muscles and left masseter; the cause of benign asymmetric hypertrophy was referred to as bruxism (10). Masseter dysfunction, which is a jaw muscle, is manifested in atrophic or hypertrophic forms. Regarding to the masseter attachment and its effects on the temporomandibular joint, as well as high prevalence of temporomandibular joint disorders (11), surveying on the changes of muscle thickness has an important role in the diagnosis of the causes of many of temporomandibular joint disorders with muscular source. Determining the thickness of the muscle is a valuable criterion for the diagnosis of health or disease. Ultrasonography is an accessible, non-invasive and inexpensive method (12). Validity and accuracy of ultrasonography in evaluating muscle thickness is quite acceptable (13). Examination of muscle thickness through ultrasonography is a kind of observational assessment for the evaluation of atrophy and hypertrophy of muscle (14, 15). Considering the prevalence of temporomandibular joint disorders and the role and effect of the masseter on joint biomechanics and lack of sufficient information about the reliability of ultrasonography for measuring the thickness of the masseter in Iranian society and changes in this muscle in bruxism, it seems necessary to conduct a research on the role of the masseter in bruxism and its possible changes. The aim of this study was to evaluate the thickness of this muscle in patients with bruxism and healthy people, and to determine the repeatability of masseter ultrasonography in Iranian society.

Methods

After being approved by the ethics committee of Shahid Beheshti University of Medical Sciences (Registration code: 66000559), this case – control study was conducted among 44 subjects in two groups (22 subjects in each group, including 11 women and 11 men) in the age range of 18 – 30 years old including patients with bruxism and healthy subjects through non-random sampling method. Healthy people participated in the study by invitation distribution, whereas patients with bruxism participated with the diagnosis of a dentist.

The volunteers who met the inclusion criteria, participated in the research after being explained about the steps of the research and after signing the written informed consent form for participation in the research. Both groups were matched in terms of age, gender, height and weight. All individuals had normal BMI (in the range of 25 – 30).

Patients with bruxism with a history of more than 2 weeks, occurring 2-3 times a week, without pain, morning stiffness, inflammatory disease and trauma to the temporomandibular joint, repair and abnormalities and tumor or infection in the jaw were included in the study, while healthy subjects who had no inflammatory disease of the temporomandibular joint, no trauma and surgery in the jaw and face were included. In cases where subjects experienced trauma to the jaw during the study, or took sedative medications and muscle relaxants, they were excluded.

Subjects could leave the research whenever they asked for it. After completing the personal characteristics questionnaire, masseter ultrasonography was performed. For this purpose, subjects were in a

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supine position, the head and neck were slightly rotated, mouths were closed, there was no pressure on teeth and hands were around the body. 12 MHz linear probe muscle was used for imaging. The gel was poured onto the probe and the probe was attempted to only contact the skin and pressure on the face was prevented. The probe was placed in the direction of the earlobe, perpendicular to mandibular ramus at a distance of 1.5 cm from the earlobe on ventricular muscle in contact with the skin. According to studies, this location is the best place to observe masseter ventricular muscle (Fig 1).

After recording the ultrasonography image, the thickness of the masseter was recorded in millimeters. To determine the repeatability, ultrasonography was performed twice within 48 hours. An ultrasonography examination was performed to determine the thickness of the masseter. To provide descriptive statistics of quantitative variables, we calculated the mean and standard deviation. To verify the repeatability of quantitative variables, ICC coefficient with 95% confidence interval was used. The Kolmogorov-Smirnov fitness test was used to examine the distribution of quantitative variables. Considering the abnormal distribution of variables, the Mann-Whitney test was used to compare the mean thickness of the masseter in the two groups.

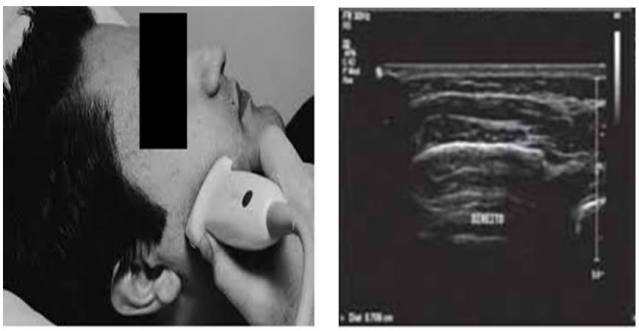

Figure 1. How to perform ultrasonography and the ultrasonography displayed on the device monitor

Results

The thickness of the masseter in patients with bruxism (11.97±0.85 mm) was higher than healthy subjects (10.76±2.2 mm) ($p<0.01$). The thickness of the masseter in men (12.44±0.4 mm and 11.44±0.25 mm, respectively) was higher than in women (11.40±0.79 mm and 10.08±3.05 mm, respectively) ($p=0.038$) (Fig 2). The results showed that the measurement of ultrasonic thickness of the masseter in resting mode has high repeatability (table 1).

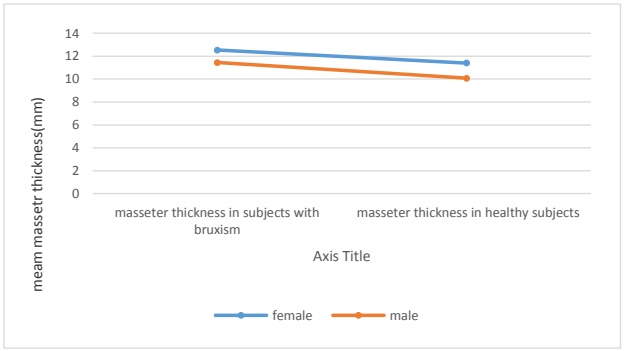

Figure 2. The thickness of the masseter in two groups of healthy subjects and patients with bruxism according to gender (n = 44)

Table 1. Intra-group correlation coefficient of masseter thickness (mm) in healthy subjects and patients with bruxism (n = 44)

Group	MDC	SEM	P-value	Max	Min	ICC
Patients with bruxism	1.11	0.40	0.002	0.94	0.37	0.79
Healthy subjects	0.42	0.15	0.001	0.95	0.49	0.84

Discussion

The results of the study showed that the average thickness of the masseter in patients with bruxism was greater than healthy subjects. This finding is similar to the study of Mangilli et al. who showed a similar increase in muscle thickness by increasing the electrical activity of the muscle through simultaneous use of electromyography and ultrasonography (6). Possibly, increasing the performance of the masseter in patients with bruxism leads to an increase in its thickness compared with healthy subjects. In the study of Satrioglu et al., the thickness of the masseter in the Turkish population was 13.5±1.9 mm (3), which is slightly more than the thickness of the masseter reported in the present study. This difference in the thickness of the masseter can be due to the difference in the studied populations and different habits of chewing, as noted by the researcher.

The subjects had a habit of chewing gum for a long period, which might increase muscle thickness. In fact, the thickness of the masseter has increased due to increase in its performance. Kubota et al. showed that the thickness of the masseter was 15.8±3 mm in 8 – 92 – years –old healthy subjects (16), which is different from the results of the present study. Considering that our study was conducted among subjects aged 18 to 30 years, the possible cause of this difference might be the

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difference in the age range in the two studies. The present study showed that masseter thickness in men is more than women. Katsaros et al. showed that masseter thickness in men (12.1±2.2 mm) was greater than women (11.6±1.4 mm) (2). Rohila et al. reported that gender affects masseter thickness (17), which is consistent with the results of the present study. Tricuveluri et al. and Volk et al. showed that in adults, the masseter thickness in men is greater than in women (4, 5). It was shown that the wider the maxillary arch is, the thickness of the masseter is higher. Skull of adult men is larger than adult women, and the facial width is positively correlated with the thickness of the masseter. Therefore, it can be concluded that probably the reason for the higher thickness of the masseter in men is the morphological difference between the two genders (18). The present study showed that the measurement of the ultrasonic masseter thickness in resting mode has high repeatability. In studies by Killiaris et al. and Emshoff et al., the thickness of the masseter was also high (1, 19). The thickness of masseter in people with bruxism is higher than the healthy subjects, and is higher in men. It is suggested that studies be carried out about the thickness of other jaw muscles in healthy subjects and patients with bruxism.

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