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ORIGINAL PAPER

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Bone Apposition in the Mandibular Angle in Adult Patients Diagnosed with Bruxism: a Digital Panoramic Based Study

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ABSTRACT

Background: Bruxism is defined as a movement disorder of the masticatory system leading to serious problem in the integrity of the oral dentition; it is characterized by teeth grinding and clenching and has been typically classified into three types: a) bruxism occurring during sleep, b) awake-related bruxism, and c) mixed sleep/awake-related bruxism. **Objective:** The aim of this study was to assess any bone apposition in the mandibular angle in a group of adult patients diagnosed with bruxism using digital panoramic radiographs. **Methods:** In the sample of 150 digital panoramic radiographs of 66 women and 84 men with an age range of 24-78 years and diagnosed with bruxism were evaluated. **Results:** Among the 300 mandibular angles evaluated, 156 (52%) showed bone apposition against 144 (48%) who did not. **Conclusion:** The changes in the mandibular angle, especially bone apposition, can help diagnosing long term bruxism on panoramic radiographs.

Keywords: Panoramic radiograph, Bruxism, Bone apposition, Mandibular angle.

ing sleep and during wakefulness (1). Awake-related bruxism, mostly connected to life stress or work pressure, is typically characterized by a semivoluntary 'clenching' activity, while bruxism during sleep which is an oromandibular behavior defined as a stereotyped movement disorder is characterized by both teeth grinding and clenching (5).

Three groups of proposed etiological factors can be distinguished: a) peripheral such as tooth interference in dental occlusion, b) central (pathophysiological) involving brain neurotransmitters or basal ganglia, and c) psychosocial such as stress or anxiety (5, 6).

Clinically, in patients with bruxism, the distribution of the amplified forces of the muscles to the teeth and to the temporomandibular joints may result in dental attrition and orofacial fatigue/pain, as well as hypertrophy of the masticatory muscles, especially the masseter (6, 7). Radiologically, a study by Türp et al. (2021) (8) concluded that long-term loads that occur during the contraction of the masticatory muscles when closing the mouth can induce a functional adaptation resulting in bone apposition at the mandibular angles.

The diagnosis of bruxism is based on clinical examination, individual self-report and especially masticatory muscles electromyography (1, 9, 10).

Bruxism activities present variable prevalence data due to potential diagnostic bias relying, in the majority of cases, on patients self-report. In a recent study conducted by Wetselaar et al. (2021) (11) aiming to assess the prevalence of awake and sleep bruxisms in the

1. BACKGROUND

Bruxism is defined as a movement disorder of the masticatory system leading to serious problem in the integrity of the oral dentition; it is characterized by teeth grinding and clenching (1) and has been typically classified into three types: a) bruxism occurring during sleep, b) awake-related bruxism, and c) mixed sleep/awake-related bruxism (2-4).

In 2018, a consensus was obtained on the difference of bruxism behaviors observed dur-

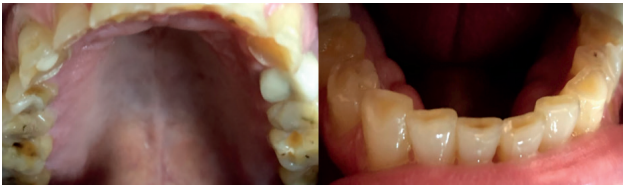


Figure 1. Intraoral photographs showing the generalized dental attrition

Dutch adolescent population, prevalence of awake-related bruxism was inferior (4.1%-4.2%) compared to sleep bruxism (7.6%-13.2%) with a slight female predominance. On the other hand, a systematic review by Melo et al. (2019) (12), concluded that the frequency of awake-related bruxism is 22–30% and Sleep bruxism is 1–15% in adults. Moreover, bruxism was unrelated to gender, and decreases with age (9, 12).

To our knowledge, association between bruxism and bone apposition in the mandibular angle region is rarely investigated and never in the Lebanese population.

2. OBJECTIVE

The aim of the current research was to investigate this association in a sample of Lebanese adults using digital panoramic radiographs.

3. MATERIAL AND METHODS

This retrospective study was conducted on digital panoramic radiographs of 150 Lebanese adult patients attending the Department of Oral Medicine and Maxillofacial Radiology at the Faculty of Dental Medicine, Lebanese University.

As by the regulation of the faculty, all the patients were informed that the radiographs might be anonymously used for research purposes at a later stage and their consent were obtained.

The inclusion criteria included: (a) patients confirming and diagnosed clinically with bruxism (history and dental attrition) (Figure 1) in the division of Oral Medicine and aged 18 years or older; b) absence of any pathological conditions or deformities of the jaws; c) good quality radiographs.

Partial or total edentulous patients as well as those who present temporomandibular joint disorders were excluded.

Digital panoramic radiographs of 66 females and 84 males (a total of 150 patients) aged between 24 and 78 years met the inclusion criteria and were included in this study. The radiographs were acquired using the Sirona digital panoramic unit (Dentsply, USA). The exposure parameters were selected according to the variability of patient's size. An oral and maxillofacial radiologist with more than 20 years of experience examined the radiographs, on the same monitor. The research procedure extended over four sessions, spaced by a period of 20 days. In order to decrease errors, the primary exploration of randomly selected radiographs was repeated 10 days later, without having in hand, the initial results.

Bone apposition was identified as uni- or bilateral modification of the shape of the basal cortical bone at the mandibular angle and classified into 3 grades (minor, mild, and major) as shown in Figure 2.

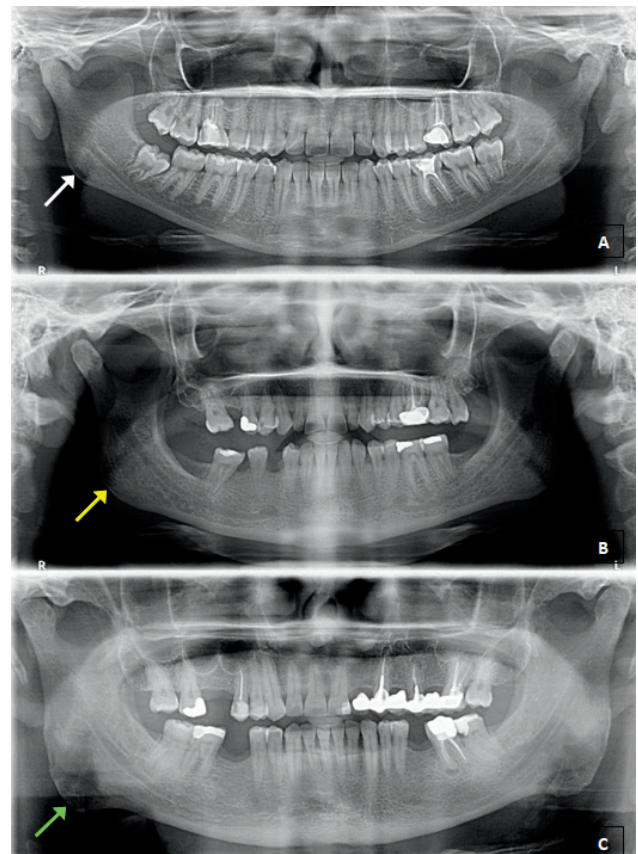


Figure 2. A) Minor grade of bilateral mandibular angle bone apposition (white arrow), B) Mild grade of bilateral bone apposition (yellow arrow), and C) Major grade of bilateral bone apposition (green arrow)

All results were saved in an Excel sheet and data were statistically analyzed using the IBM® SPSS® software version 20.0 (SPSS Inc, Chicago, Illinois).

4. RESULTS

This study was conducted to assess the mandibular angle apposition in a study group comprising 150 patients diagnosed with bruxism divided in 84 men and 66 women. The median age of the study group was 51 years. 56% of the patients were male and the mean age was 52 years, ranged between 27 and 78 years, and 44% were female with mean age of 50 years ranged between 24 and 76 years (Table 1).

Based on the panoramic radiographs of 300 mandibular angles (150 patients), the bone apposition was observed in 156 mandibular angles (52%) against 144 angles (48%) considered with no bone apposition. The mandibular angles presenting bone apposition were classified into three grades: minor, mild and major.

Most of these patients had bilateral appositions, but not

Patients with bruxism	Females	Males	Total
Number	66	84	150
Mean age	50 (24-76)	52 (27-78)	51(24-78)
Bone Apposition	34	44	78
No Bone Apposition	32	40	72

Table 1. Distribution and prevalence of mandibular bone apposition of patients diagnosed with bruxism according to gender and age

Mandibular angles bone appositions	Bruxism Group									
	No Apposition		Minor Apposition		Mild Apposition		Major Apposition		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Left mandibular angle	4	3	3	2	1	1	0	0	8	6
Right mandibular angle	4	3	2	3	2	0	0	0	8	6
Bilateral mandibular angle	72	58	38	32	24	20	18	10	152	120
Total	80	64	43	37	27	21	18	10	168	132

Table 2. Prevalence, side and grade of bone apposition in the mandibular angles of group diagnosed with bruxism.

...ecessarily with same degree however the unilateral apposition was observed in 14 patients (8 males and 6 females).

The minor, mild and major degrees of mandibular bone apposition were distributed, respectively in 26.67%, 16%, and 9.33% of all angles. Almost 70% of patients presenting bone apposition were adults with 42 years old of mean age compared to 22% of younger patients and with no differences between males and females.

In summary, all patients were distributed in 65 subjects with no bone apposition (36 males, 29 females), 71 with bilateral apposition (40 males, 31 females) and 14 patients with unilateral apposition (8 males, 6 females) (Table 2).

5. DISCUSSION

Association between bruxism and bone apposition in the mandibular angle was rarely investigated in the scientific literature. Moreover, the findings of the present study represent the first report assessing this topic in Lebanon. Based on our study, among the 300 mandibular angles assessed (150 patients/radiographs), bone apposition was observed in 156.

The relationship between different bony changes and parafunctional habits was the topic of many studies; for Panagiotopoulou et al. the functional and parafunctional loading of the mandible generate forces that lead to tensile and compressive strains and bony deformation (13). Likewise, for Yamada et al. more the number of parafunctional habits is high, more the risk of condylar bony change is greater (14).

As for the bone apposition in the mandibular angles, for Türp et al., it should be interpreted as a functional adaptation to the long-term amplified loads that occur during the contraction of the jaw closing muscles due to bruxism (8). For Panagiotopoulou et al. (13), Wang et al. (15), and Sun et al. (16), the hyperactivity of the masticatory muscles, especially the masseter and the medial pterygoid, with their insertions at the mandibular angles could be the logical explanation of these appositions due to their stress activity.

In the same context, Kebede and Megersa concluded that masseteric hypertrophy may induce prominent exostoses at the angle of the mandible (17).

It has been suggested that bone apposition was not expected in adolescents [12], because of the relatively short duration of loading of the mandibular angles, which was apparently insufficient to manifest as visible bone change [8]. In our study, we excluded this age range and we believe

that our findings (bone apposition in only 22% of young patients aged between 24 and 30 years) corroborate this suggestion.

Our study is not without limitations. Since our results were based on two-dimensional radiographs, further studies using advanced techniques and software based on three-dimensional images are needed in the future to evaluate and measure bone volumetric changes and correlate it to bruxism.

6. CONCLUSION

This research was conducted to assess the bone apposition in the mandibular angle related to bruxism. Our results showed different degree of bone appositions in the gonial area. In addition to clinical examination, radiologically diagnosed bone apposition may serve as an extra diagnostic indicator of bruxism. Moreover, since such morphological changes take long time to develop, they may provide an indication about the presence of bruxism and its duration.

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- **Competing interests:** The authors declare that they have no competing interest. The documents and images examined during this study belong to the Department of Oral Medicine and Maxillofacial Radiology and are available only upon on reasonable request.
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