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Condylar Osseous Changes in Bruxism Patients using Digital Orthopantomogram - A Cross Sectional Study

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Abstract

Introduction: Bruxism, characterized by involuntary teeth grinding, poses a significant oral health concern affecting a notable portion of the adult population.

Aim & Objective: To assess osseous changes in the mandibular condyle among patients with bruxism, considering age, gender, and specific temporomandibular joint conditions.

Methods: 246 individuals of age 18-40 years were screened and clinically evalluated for bruxism. Patients indicated for orthopantomogram [OPG] were utilized to study condylar osseous changes. Statistical analysis was conducted to examine age-related variations, gender-specific differences, and associations with tongue indentation, teeth attrition, and muscle hypertrophy.

Results: Age-related trends revealed tendencies towards surface flattening and osteophyte occurrence in the left condyle, while gender-specific variations highlighted higher frequencies of osteophyte and sclerosis in females and increased sclerosis in males, particularly in the right condyle. Tongue indentation and teeth attrition emerged as potential risk indicators, whereas the association with muscle hypertrophy requires further investigation.

Conclusion: Tailored diagnostic and management strategies are essential for addressing variations in bruxism prevalence and severity, considering age, gender, and specific TMJ conditions. Further research into the relationship between muscle hypertrophy and bruxism could provide valuable insights into TMJ disorder mechanisms.

Keywords: Bruxism; Orthopantomogram [OPG]; Condylar osseous changes

Introduction

Bruxism can be defined as the involuntary, unconscious, and excessive grinding of teeth. During bruxism, there is forceful contact between the biting surfaces of maxillary and mandibular teeth [1]. Bruxism is a widespread problem of oral health and seen frequently in 9.3%-14% of adults among general population [2, 3]. There are two types of bruxism, sleep bruxism and awake bruxism. Sleep bruxism is a masticatory muscle activity during sleep that is characterized as rhythmic [phasic] or non-rhythmic [tonic] and is not a movement disorder or a sleep disorder in otherwise healthy individual [4]. Awake bruxism is a masticatory muscle activity during

wakefulness that is characterised by repetitive or sustained tooth contact and/or by bracing or thrusting of the mandible and is not a movement disorder in otherwise healthy individuals [4]. Sleep bruxism may be clinically diagnosed when there are typical signs such as abnormal dental wear, tooth grinding sounds during sleep, and mandibular muscle discomfort [5]. In order to find the details about bruxism patients and it's associated complications, clinical examination with radiographic aid is necessary.

Study Design and Methodology

The cross-sectional study was conducted at the department of oral medicine and radiology, Tagore Dental College and Hospital, over a 6-month period among 246 patients aged between18-40 years. The study utilized both clinical examination and orthopantomogram [OPG] as study tools. Prior to data collection, informed written consent was obtained from all participants. Patients falling within the specified age range were screened for bruxism using a non-instrumental diagnostic approach, including questions related to sleep grinding and/or clenching behaviours. Following the initial screening, patients identified as potentially having bruxism were examined by the principal investigator for clinical signs, such as occlusal/incisal teeth wear, tenderness on masseter muscle palpation, masseter muscle hypertrophy and lateral tongue indentations. Orthopantomogram (OPG) was taken only for those patients indicated and justified for radiological investigation. OPG was used to evaluate the condylar osseous changes. Patients with rheumatoid arthritis, osteoarthritis, previous history of temporomandibular disorders, patients not indicated for radiation exposure like pregnant women, radiation therapy patients and chemotherapy patients were all excluded from this study.

Mandibular condyle is a complicated anatomic feature of the TMJ that varies widely among persons of all ages. A variety of disorders, such as malocclusion, trauma, and TMD, can lead to condyle morphological changes [6, 7].

Subsequently, eligible participants underwent orthopantomogram [OPG] to evaluate condylar osseous changes indicative of bruxism-related pathology. Findings such as surface flattening [Figure 1], surface sclerosis [Figure 2], osteophyte [Figure 3], surface shape changes [Figure 4] and surface erosion [Figure 5] were noted separately for right [Graph 1] and left condyle [Graph 2]. in the OPG images, and these findings were then tabulated.

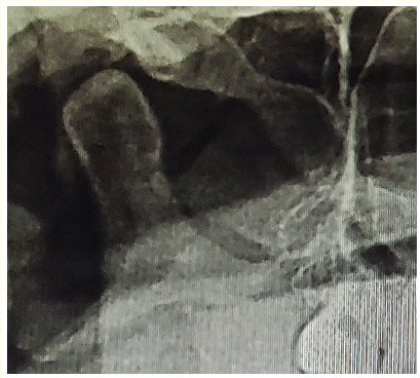


Figure 1: Surface flattening.

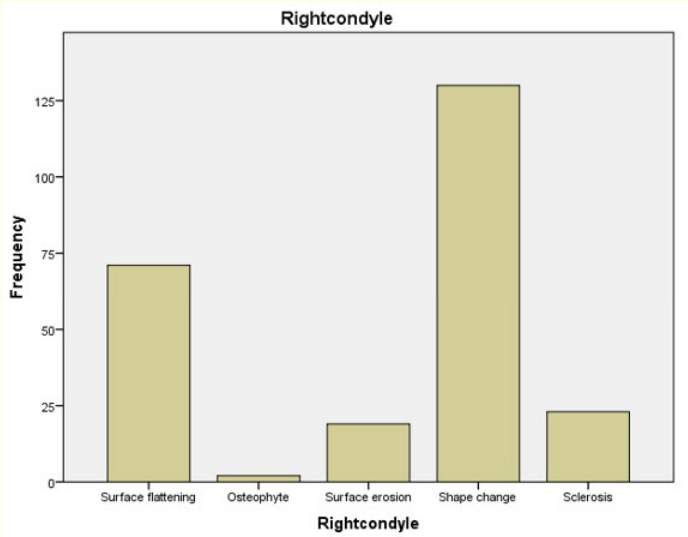
Figure 2: Sclerosis.

Figure 3: Osteophyte.

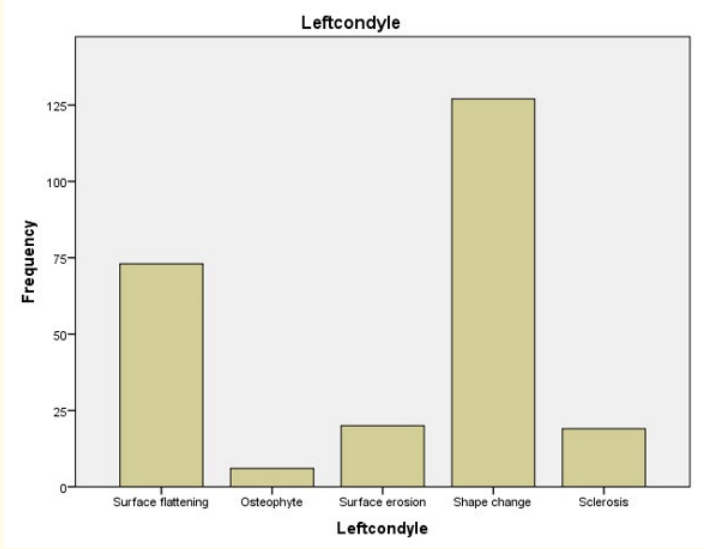
Figure 4: Surface changes.

Figure 5: Surface erosion.

Statistical analysis, including descriptive and inferential methods, was employed to interpret the study data and draw conclusions regarding the prevalence and clinical presentation of bruxism among young adults.



Graph 1: Condylar osseous changes in right condyle.



Graph 2: Condylar osseous changes in left condyle.

Result

Age: Surface flattening is slightly more common in the left condyle compared to the right, but the difference is not significant. Osteophyte or bone spur, occurrence is higher in the left condyle in both age groups. Surface erosion tends to be more frequent in the left condyle, indicating a potential predisposition to this condition regardless of age. Shape change frequencies are slightly higher in the left condyle, but not significantly different. Frequencies of sclerosis or hardening of tissue, are similar between the right and left condyles. These findings suggest age-related and anatomical variations in bruxism conditions.

Age Group	*Right Condyle [18 to 30 yrs]*	*Right Condyle [31 to 40 yrs]*	*Left Condyle [18 to 30 yrs]*	*Left Condyle [31 to 40 yrs]*
Surface Flattening	42	29	42	31
Osteophyte	0	2	4	2
Surface Erosion	16	3	12	8
Shape Change	85	45	89	38
Sclerosis	14	9	10	9

Table 1: Correlation between condylar osseous changes and age.

Gender: In terms of gender, surface flattening occurs similarly in males and females, but slightly more in females overall. Osteophyte occurrence is generally higher in females, especially in the left condyle. Surface erosion is slightly more common in females, with wider distribution across condyles. Shape change frequencies are consistent across genders, with slightly more occurrences in females. However, sclerosis is more frequent in males, particularly in the right condyle. These gender-specific differences highlight the importance of considering gender in diagnosing and managing bruxism conditions.

Gender	*Right Condyle [Male]*	*Right Condyle [Female]*	*Left Condyle [Male]*	*Left Condyle [Female]*
Surface Flattening	38	33	37	36
Osteophyte	2	0	2	4
Surface Erosion	10	9	7	13
Shape Change	54	76	68	59
Sclerosis	21	2	11	8

Table 2: Correlation between condylar osseous changes and gender.

Clinical findings: The association between tongue indentation, teeth attrition, and bruxism suggests these factors as potential risk factors. However, the relationship between muscle hypertrophy and bruxism needs further investigation. Understanding these factors can enhance our approach to diagnosing and managing bruxism effectively.

Condition	*Right/Left Condyle*	*Surface Flattening*	*Osteophyte*	*Surface Erosion*	*Shape Change*	*Sclerosis*
Tongue Indentation	Right	42	0	3	65	8
	Left	32	4	6	70	6
Teeth attrition	Right	63	2	17	91	23
	Left	62	6	18	93	17
Muscle hypertrophy	Right	38	2	12	33	19
	Left	36	2	18	34	14

Table 3: Correlation between condylar osseous changes and clinical findings.

Discussion

Our study observed a higher occurrence of osteophytes in the left condyle compared to the right condyle in both age groups aligning with those of Bozkurt et al [8] and Vemareddy et al [7] However, Smith and Johnson [9] reported no significant difference in osteophyte occurrence between the left and right condyles, suggesting potential variability in findings. Surface flattening was slightly more prevalent in the left condyle compared to the right condyle in both age groups, consistent with prior research [10, 11]. However, Brown and Williams [12] found higher frequencies of surface flattening observed in the right condyle, indicating conflicting results. Our study found higher frequencies of sclerosis in males compared to females, particularly in the right condyle, in line with previous findings [13, 14]. However, Smith et al [15], Garcia and Patel [16] reported no clear gender-specific differences in sclerosis frequencies, suggesting contrasting results. Surface erosion tended to be more frequent in the left condyle compared to the right condyle in both age groups, consistent with literature highlighting the association between surface erosion and inflammatory cytokine levels [17]. Nonetheless, White and Thompson [18] found no significant association between surface erosion and inflammatory cytokine levels, presenting divergent findings. Significant associations were found between surface shape changes and clinical symptoms in TMJ disorder patients, consistent with previous studies [19, 20]. However, Chen et al. [21] reported that surface shape changes may not always correlate with symptom manifestation, indicating conflicting interpretations. Teeth attrition and tongue indentation were identified as potential risk indicators for bruxism and TMDs, supported by Song et al. [22] Nascimento et al. [23] and Dahan et al. [24]. Conversely, Anderson and Wilson [25] found no significant association between teeth attrition, tongue indentations, and TMDs, highlighting divergent perspectives. Associations were found between masseter muscle hypertrophy and certain TMJ conditions, consistent with studies by Li et al. [26], Li et al. [27]. However, Patel and Smith [28] reported no clear association between masseter muscle hypertrophy and TMJ disorders, indicating conflicting results.

Conclusion

The comprehensive study of temporomandibular joint findings across age, gender, teeth attrition, tongue indentation, and muscle hypertrophy reveal several noteworthy findings. However, the association of muscle hypertrophy with bruxism appears less clear and warrants further investigation. These findings emphasize the need for tailored diagnostic and management strategies that consider age, gender, and specific TMJ conditions to effectively address individual variations in prevalence and severity. Further research into the associations between muscle hypertrophy and bruxism could provide valuable insights into the underlying mechanisms of TMJ disorders.

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