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Degenerative Bone Change in Iraqi Patient Using Cone-Beam Computed Tomography: Influence by Gender

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Abstract

Background Temporomandibular disorder (TMD) is a disorder with many possible etiologies (age, gender, ethnicity, parafunctional habit, etc.) and can cause degenerative bone change on the head of the condyle. It is best seen by cone beam computed tomography (CBCT). **Objectives** This study aimed to assess the effect of gender on the degenerative bone change of the condyle and joint space. **Materials and Methods** a prospective study of 97 study groups (194 TMJ) aged (20-50) The study group was TMD patients selected according to diagnostic criteria of temporomandibular disorder DC/TMD, and the study group were divided into two subgroups (Male and female). Then CBCT was taken and measured for the patient. The condyle degeneration was classified into (Flattening, erosion, osteophyte, and sclerosis. **Results** There was no significant difference between degenerative bone change (flattening. Erosion, and osteophyte) and genders. A significant difference, however, was found between genders in sclerosis and joint space. **Conclusion** TMD affects females more than males. Males have more joint space than females, and females have more degenerative condylar bone change compared to males, Erosion and flattening were the most frequent degenerative change in the condyle, and sclerosis was more frequent in females. Also, joint space in females was narrower than in male

Keywords: TMD; CBCT; gender.

Introduction

The Temporomandibular Joint (TMJ), or the mandibular joint, is a joint that is covered with a fibrous layer, and the joint space is split into two halves by the articular disc, (which is formed of fibrocartilage): the superior space and the inferior space. (Glick, 2021). The evidence suggests that TMD is a multifactorial complex disorder. It doesn›t follow simple classic etiologic pathways in which a single cause is identified. There is no sufficient and necessary etiologic factor; instead, epigenetics plays a role. Environmental factors, and phenotypic factors, are dynamic, and interact with one another over time; feedback loops are another part of this type of interaction (Glick, 2021. There is no single cause or theory that can explain the cause of TMDs; TMDs are associated with multifactorial, which are not necessarily causal. A hormonal factor was one of these factorials which could affect the bone of the condyle (Bhargava and Gurjar, 2021). There is a controversy about the influence of gender on TMD as many studies reported that there was a strong female predominance than

males for TMD, while others found no difference between the two gender clinically (Jo and Chung, 2021). Several factors, including age, gender, number of remaining teeth, mastication patterns, etc., were found to affect TMJ bone change. Therefore, we need paraclinical examinations to evaluate the variation of condylar degenerative change. Even while clinical exams are typically sufficient to arrive at an appropriate diagnosis of TMJ problems, supplemental imaging investigations should be undertaken to diagnose and establish the origin of TMDs and structural abnormalities and functional disorders. Although clinical examinations usually are adequate to reach an accurate diagnosis of TMDs, supplementary imaging examinations should be considered to diagnose and determine the origin of TMJ disorders and structural alterations and functional disorders. To reach a definite diagnosis, it is recommendable to use both radiographic examinations with clinical diagnosis (Daneshmehr et al, 2020). Traditionally, TMJ analysis has been performed using 2D images. That may be adequate in certain situations; nonetheless, they also have their limits (Nancy, 2013). Hence, high-tech imaging techniques, including CT, MRI, and CBCT, are essential, developments in 3D technology, particularly CBCT, have allowed us to do comprehensive analyses of the degenerative change of the condyle (Nithin et al, 2021). Studies assessing TMJ and condyle degeneration have increased in number in recent years. The prevalence of TMJ alterations in asymptomatic patients, the form of the condyle head in various persons, the correlation between age and morphologic changes in the condyle bone, etc. have all been evaluated in these studies (Yalcin et al, 2019; Ayyıldız et al, 2021). There are few studies on the degenerative change of the condyle with CBCT in Iraqi patients, and the Previous studies were inadequate to assess the joint space area. This study aimed to study the relationship between condyle degenerative bone change (flattening, erosion, sclerosis, osteophyte, and joint space) and clinical findings in terms of gender on CBCT images.

Materials and Methods

A prospective study of 97 study groups (194 TMJ) aged (20-50) The study group was selected randomly of temporomandibular disorder (TMD) patients according to research diagnostic criteria of temporomandibular disorder DC/TMD, and the study group were divided into two subgroups (Male and female). Patients were sent to the radiation department at Ghazi- ALHariri Hospital for CBCT imaging using the "KaVo 3 D eXam system" over the period of seven months (December 2021 – June 2022). The parameters of the CBCT of TMJ were done with the med view of 8×15, 90 KV, 6.3 mA, 4.5 s, and 13 µSv. CBCT images were converted to DICOM format. And the condyle degeneration was classified into (Flattening, erosion, osteophyte, and sclerosis, and the joint spaces had been measured. Participants completed a formal agreement form after being given thorough information about the project, Approval and official permission were obtained from the Ministry of Health.

Exclusion criteria:
1. Patients with bone disease (osteoporosis or Paget's disease).
2. Patients on corticosteroids for a long time.
3. Patients with autoimmune diseases.
4. Patients who had received previous surgical treatment in TMJ.
5. Patients having developmental defects.
6. Pregnant women.
7. Patients with TMJ ankylosis.
8. menopause women
9. Patients who have a fractured head of the mandible
10. Kennedy classification (cl 2 and 3)

Statistical Methods

The database was compiled using an Excel file. To analyze the data, SPSS v.28.
•Test of Chi-square was used for qualitative variables to assess the significance of the associations.

•Two independent quantitative variables were assessed by T-test

Results

As shown in (Table 1), there was an insignificant difference in degenerative bone change (flattening. Erosion and osteophyte) between genders but a significant difference was found between gender with sclerosis and joint space. Joint space was larger in males than in females, especially, in the right joint. Flattening and erosion was the most frequent bone change in both genders. While a significant difference was found between genders with sclerosis, the female was the most frequent. Regarding osteophyte, there was no difference found between the two genders.

Table (1): The relation between gender and degenerative bone change of the condyle.

Variables		Male N	%	Female N	%	Total N	%	P_value
Bone Change	Yes	29	85%	59	93.7 %	88	90.7%	0.176
	No	5	14.7%	4	6.3%	9	9.3%	
Erosion	Yes	17	50.0%	41	65.1 %	58	59.8%	0.148
	NO	17	50.0%	22	34.9 %	39	40.2%	
Sclerosis	Yes	9	26.5%	30	47.6 %	39	40.2%	0.043
	NO	25	73.5%	33	52.4 %	58	59.8%	
Flattening	Yes	17	50.0%	41	65.1 %	58	59.8%	0.148
	NO	17	50.0%	22	34.9 %	39	40.2%	
Osteophyte	Yes	8	23.5%	20	31.7 %	28	28.9%	0.394
	NO	26	76.5%	43	68.3 %	69	71.1%	
Total		34	100%	63	100%	97	100%	
Mean ± SD								
Space Right		3.9 ± 1.1		3.3 ± 0.7		0.043		
Space Left		3.8 ± 0.9		3.3 ± 1.0		0.098		

Discussion

A systematic review and meta-analysis by (Bueno et al, 2018), was reported that the female gender has a more than two-fold increased chance of having TMD than the male. studies done on Iraqi people found that female was more than male (Alhussien and Ryan, 2017; Kadhem and Aswad, 2020). In contrast, a study done by (Nguyen et al, 2017) shows that gender wasn't a significant factor. It is unclear why women are more likely to suffer from TMD than males, whether this is due to differences in genetics, psychology, or societal roles. Hormonal factors (Vilanova et al, 2015); cultural and societal influences (Alharthy et al, 2016), and higher levels of job stress for women may all play a role in these gender variations (Theorell et al, 2015), variations in pain tolerance and health-seeking behaviour (Racine et al, 2012). While men and women experience mental health issues at comparable rates, the types of problems experienced differ; women have higher rates of depression and anxiety than males. Due to the elevated risk for TMD in depressed people might be one reason why males and females have different rates of TMD, as stated (Bueno et al, 2018). As a multifactorial disorder, TMD is difficult to diagnose due to a lack of uniformity in TMD examination. Most of the tools discussed in the literature review are also subject to methodological and logistical limitations, such as their potential for being time-consuming and costly (Borges et al, 2021). Thus, in our study, as shown in (table 1) The patient›s clinical diagnosis was made by the Research Diagnostic Criteria for Temporomandibular Disorders DC/TMD. (Schiffman et al, 2014) (Appendix 2). RDC/TMD was created in 1992 with the expectation that it would only be used for research. The DC/TMD later extended its application to clinically in 2014. These diagnostic tools are designed to give an accurate, consistent, and trustworthy standard for identifying TMD subtypes, the precise specification of the criteria used in correlated research is one of the main methodological problems (Valesan et al, 2021). Patients with confirmed clinical diagnoses of other, less

common types of TMD were not included in our research due to a lack of statistical power. Tomographic studies have shown that women are more likely to have an anterior displacement of the articular disc and a predominance of TMD due to their posterior condylar location, which may biomechanically predispose individuals to these conditions (Paknahad et al, 2015). The study of (Nogueira et al, 2018) pointed out that Females, in contrast to males, have lower pain thresholds and different muscular anatomy. Estrogen, the principal female sex hormone, may have a role in condylar resorption. Receptors for estrogen and progesterone have been found in the temporomandibular joints of primates. When compared to male baboons, the TMJs of female baboons have estrogen receptors. This discovery provides more evidence that estrogen-mediated cellular activity may be linked to the majority of TMJ issues in women, estrogen has a major role in the pathogenesis of postmenopausal RA or osteoarthritis (Armaou et al, 2020). Regarding condylar resorption, the intercellular communication channels connected to estrogen low level and are likely to be more important (cytokines). The delicate equilibrium between two cytokines is a topic of intense attention. Membrane-bound ligand called receptor activator of nuclear factor kappa B (RANKL) is produced by osteoblasts. Through its interaction with RANK, RANKL promotes the development of osteoclast precursors and the activation of mature osteoclasts (Armaou et al, 2020). In vitro, studies have revealed that estrogen inhibits RANKL›s ability to stimulate osteoclast development (Shevde et al, 2000). An example of a naturally occurring RANKL inhibitor is osteoprotegerin (OPG), defined as a receptor for soluble tumour necrosis factor (Armaou et al, 2020). OPG inhibits osteoclastic bone resorption by binding competitively to RANKL and blocking the function of the receptor RANK (Villa et al, 2006). To maintain healthy bones, a healthy ratio of these two cytokines is necessary. (OPG) expression is regulated by estrogen receptors, and it has been proven that estrogen protects the bone against inflammatory stimuli (Kramer et al, 2004). When estrogen levels are low, OPG is not stimulated, and inflammatory factors might block the production of new bone or even cause bone resorption, in addition, consistently low circulating estrogen levels in women are associated with an increase in inflammatory cytokines, which enhances arthritic symptoms and reduces bone mineral density, in addition to the RANKL/OPG impact (Armaou et al, 2020). Males and females may experience bone loss in different ways. It had been documented that significant bone loss occurs after menopause in women due to a lack of sex hormones, but it starts in later life in men due to age-related factors (Coşgunarslan et al, 2021), To remove the probable influence of gender on bone structure, the study and the control groups were to 50 age years old for both male and female. In this study, as in Table (1), the degenerative condylar change of TMD patients was insignificantly different between genders, except for sclerosis was statistically significant with a P-value of (0.043). This agreed with (Seo et al, 2021), who found a significant association between sex and sclerosis it was more among women than in men, while in flattening and erosion of the condyle and osteophytes: no significant gender differences. In our study, a significant difference was found in the right joint space and the gender group, with male space higher at about 3.9 while in female 3.3. This result was the result of a previous study that found that male patients had larger joint spaces than female patients (Alqahtani et al, 2022). While the findings of (Hansson et al, 1977) that it was an insignificant difference in the joint space between the genders.

Conclusions

TMD affects females more than males. Males have more joint space than females, and females have more degenerative condylar bone change compared to males. Erosion and flattening was the most frequent degenerative change in the condyle, sclerosis was more frequent in female. Also, joint space in females was narrower than

in males.

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