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Radiographical evaluation of articular eminence inclination and height by cone beam computed tomography in Diyala

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KEY WORDS:
Articular eminence, gender, location, cone beam computed tomography.

ABSTRACT

Background: After compared to other human joints, the temporomandibular joint, a synovial joint with complex biaxial movements and has the largest range of motion. It is also identified as a ginglimoartrodial joint. When the jaw is moved the condylar process travels along articular eminence, part of temporal bone. Individual differences occur via the inclination of articular eminence, which controls the direction of condylar movement and the grade of disc rotation over the condyle.

Aims of the study: Radiographical assessment of inclination of eminence and eminence height conferring to gender and location via cone beam computed tomography in Diyala.

Materials and methods: The study samples collected of seventy individuals (140 joints) twenty-two male and forty-eight female with age range from (20-55) years old. Inclination of eminence and eminence height were measured in study via cone beam computed tomography. Statistical Analysis, the System-SAS (2018) program was employed to determine how different study parameters affected the various groups.

Results: The results show articular eminence inclination and height in sides right and left, males have verified higher mean value than females. The results show inclination of eminence and eminence height in right side have recorded higher mean value than left side with a statistically non-significant relationship.

Conclusions: Males have a steeper eminence than females. Height of eminence in male are higher than female. .

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INTRODUCTION

Temporomandibular joint (TMJ) is compound articular structure positioned between temporal bone and jaw. With the assistance of a dynamic balancing system, it can achieve mandibular functions and move in all three three-dimensional planes. Process of mandibular condyle forms lesser bone fragment of joint, whereas glenoid fossa forms the superior bone part. [1]

An important element of TMJ, articular eminence (AE) situated on temporal bone and represents anterior limit of mandibular fossa. Articular tubercle, a different structure should not be mistaken with the AE on lateral sideways of AE wherever ligament of TMJ originates. Angle planned by eminence of article and Frankfort Horizontal (FH) plane, or any further horizontal level, is known as articular eminence inclination (AEI). Usual range of angle scopes is between 30° and 60°. Flat inclinations are those with values less than thirty degrees, and steep inclinations are those with values more than sixty degrees. [2]

Articular portion of temporal bone (squamous portion) is called articular fossa. Via vertex of articular eminence as reference point, articular fossa exhibitions normal depth of male (4.73 mm) and female (4.34 mm) patients. [3]

Posterior portion of articular eminence stays into anterior portion of mandibular fossa. Laterally to AE is zygomatic process root of temporal bone which, shapes the arch of zygoma with temporal process of zygomatic bone. [4]

Distance between articular eminence's lowest point and the fossa's highest point has been used to estimate the articular eminence height. [5]

Angle between posterior wall of AE and horizontal orientation level is known as the AE inclination, and it acts a significant part in biomechanics of the TMJ and general masticatory system. [6,7] Degrees can be used to express this inclination, with normal values dropping between 30° and 60°.[8]

So, the object of this study is to estimate radiographical variations of articular eminence including inclination and height conferring to gender and location in a sample of the Diyala population via cone beam computed tomography.

MATERIAL AND METHODS

Samples: The study samples comprise of seventy individuals (140 joints) twenty-two males and forty-eight females with age variety from (20-55) years old. The individuals who come to the dentistry center to undergo (CBCT) scanning meant for various diagnostic objectives do not consume temporomandibular disorder (TMD) constructed on a clinical valuation.

Imaging: CBCT scanner (NewTom VGi) TM was used to accomplish cone beam computed tomography pictures. The CBCT pictures with a voxel size of 0.5 mm were attained at 110 VP, 5.7 mA, and field of view (14 cm or 24 cm ×16 cm x 19 cm) for a duration of 24 seconds. Normal occlusion, non-edentulous patients, and without (class I, II Kennedy classification, history of trauma, facial asymmetry, fracture, and cystic lesion of TMJ) were comprised in the study's image gathering.

Measurements: Inclination of articular eminence and eminence height measurements were determined created on methods described by İlgüy et al., [9]. The method (top-roof line) was used to evaluation eminence inclination, which is definite as the angle that molded among Frankfort horizontal level in sagittal slice and plane that passes between deepest point of AE and highest point of mandibular fossa. Deepest point of AE and the highest point of mandibular fossa were drawn together to form plane that connected them. The horizontal Frankfort plane was drowned. The inclination of AE was represented by an angle measured between two planes in the sagittal section (Figure 1). The left and right sides experienced by this method.

The perpendicular distance between highest point of mandibular fossa and bottom point of articular eminence was used to calculate eminence height (Eh). (Figure 2).

One investigator used CBCT pictures to measure articular eminence height and inclination.

Figure 1: The measurement of articular eminence inclination in right side of 33 years old female on CBCT in sagittal section by method (top-roof line).

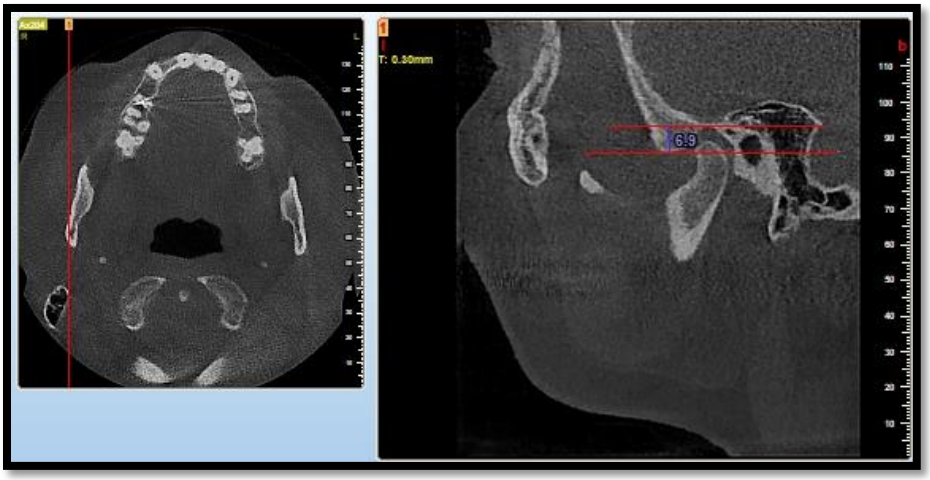

Figure 2: The measurement of articular eminence height in right side of 33 years old female on CBCT in sagittal section.

Statistical Analysis:

The SAS (2018) software was utilized to discover the effect of variance variables on the study parameters. In this investigation, the t-test was employed to compare means statistically.

RESULTS

The results demonstrate articular eminence inclination in sides right and left, males have verified higher mean value (right 40.73°, left 38.37°), than females (right 38.13°, left 37.75°), with a statistically non-significant relationship as shown in (table 1).

Table 1: Comparison between right and left location of articular eminence inclination regarding gender.

Groups	Location	No.	Mean	SD	SE	MP (t-test)	Df	C.S. (*)
Male	Right	22	40.73	6.37	1.36	3.967 NS	1 (Total =21)	0.349 NS
	Left	22	38.87	6.66	1.42			
Female	Right	48	38.13	5.08	0.73	2.240 NS	1 (Total =47)	0.737 NS
	Left	48	37.75	5.93	0.86			

NS: Non-Significant.

Regarding articular eminence height in sides right and left, males have documented higher mean value (right 7.49 mm, left 7.24 mm), than females (right 6.93 mm, left 6.88 mm), with a statistically non-significant relationship as shown in (table 2).

The results show articular eminence inclination in right side, male have recorded higher Mean ± SE (40.73 ±1.36), than right side of female Mean ± SE (38.13 ±0.73), with a statistically non-significant relationship as shown in (table 3).

Also, the results show articular eminence inclination in left side, male have recorded higher Mean ± SE (38.87 ±1.42), than left side of female Mean ± SE (37.75 ±0.81), with a statistically non-significant relationship as shown in (table 3).

Table 2: Comparison between right and left location of articular eminence height regarding gender.

Groups	Location	No.	Mean	SD	SE	MP (t-test)	Df	C.S. (*)
Male	Right	22	7.49	0.98	0.21	0.704 NS	1 (Total =21)	0.477 NS
	Left	22	7.24	1.30	0.28			
Female	Right	48	6.93	0.89	0.13	0.419 NS	1 (Total =47)	0.813 NS
	Left	48	6.88	1.16	0.17			

NS: Non-Significant.

The results show articular eminence height in right side, male have recorded higher Mean ± SE (7.49 ±0.21), than right side of female Mean ± SE (6.93 ±0.13), with a statistically significant relationship as shown in (table 4).

Also, the results show articular eminence inclination in left side, male have recorded higher Mean ± SE (7.24 ±0.28), than left side of female Mean ± SE (6.88 ±0.17), with a statistically non-significant relationship as shown in (table 4).

Table 3: Statistical differences for articular eminence inclination regarding location between right and left side.

Measurement	Gender	Mean ± SE		T-test (P-value)
		Right side	Left side	
Articular eminence inclination	Male	40.73 ±1.36	38.87 ±1.42	3.967 NS (0.349)
	Female	38.13 ±0.73	37.75 ±0.81	2.834 NS (0.071)
	T-test (P-value)	2.834 NS (0.071)	3.169 NS (0.482)	---

NS: Non-Significant.

Table 4: Statistical differences for articular eminence height regarding location between right and left side.

Measurement	Gender	Mean ± SE		T-test (P-value)
		Right side	Left side	
Articular eminence inclination	Male	7.49 ±0.21	7.24 ±0.28	0.704 NS (0.477)
	Female	6.93 ±0.13	6.88 ±0.17	0.419 NS (0.813)
	T-test (P-value)	0.474 * (0.0209)	0.619 NS (0.247)	---

NS: Non-Significant.

Results show articular eminence inclination in right side, have recorded higher mean value (38.95°), than left side (38.10°), with a statistically non-significant relationship as shown in (table 5). Also, articular eminence height in right side, have recorded higher mean value (7.11mm), than left side (6.99mm), with a statistically non-significant relationship as shown in (table 6).

Table 5: Comparison between right and left location of articular eminence inclination.

Groups	Location	No.	Mean	SD	SE	MP (t-test)	Df	C.S. (*)
Articular eminence inclination	Right	70	38.95	5.61	0.67	1.966 NS	1 (Total =69)	0.397 NS
	Left	70	38.10	6.14	0.73			

NS: Non-Significant.

Table 6: Comparison between right and left location of articular eminence height

Groups	Location	No.	Mean	SD	SE	MP (t-test)	Df	C.S. (*)
Articular eminence height	Right	70	7.11	0.95	0.11	0.364 NS	1 (Total =69)	0.541 NS
	Left	70	6.99	1.20	0.14			

NS: Non-Significant.

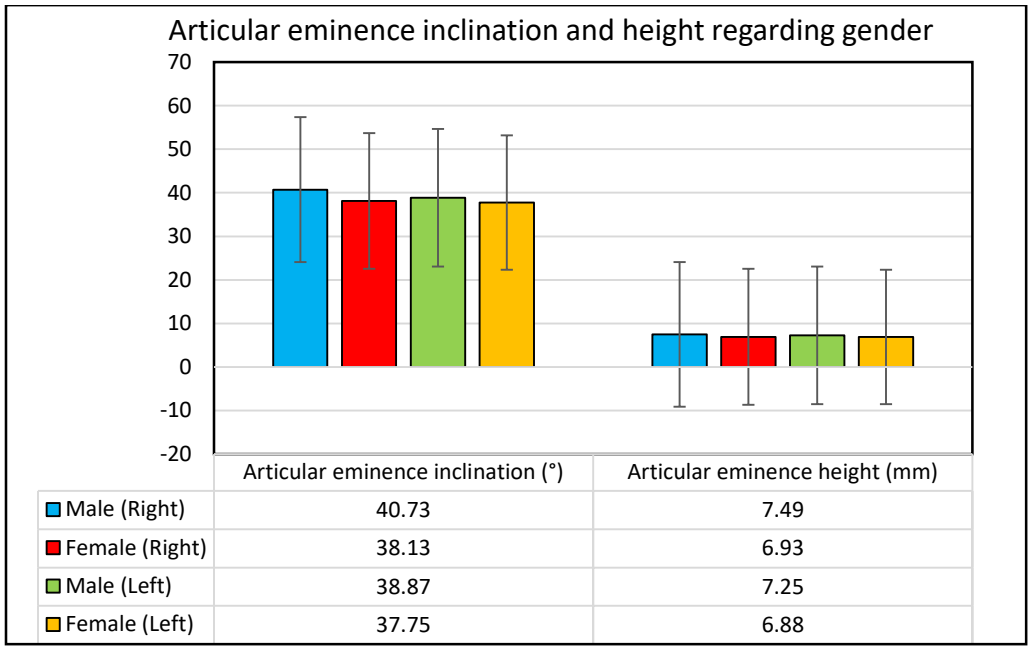

Figure 3: Cluster bar charts of articular eminence inclination and height regarding gender.

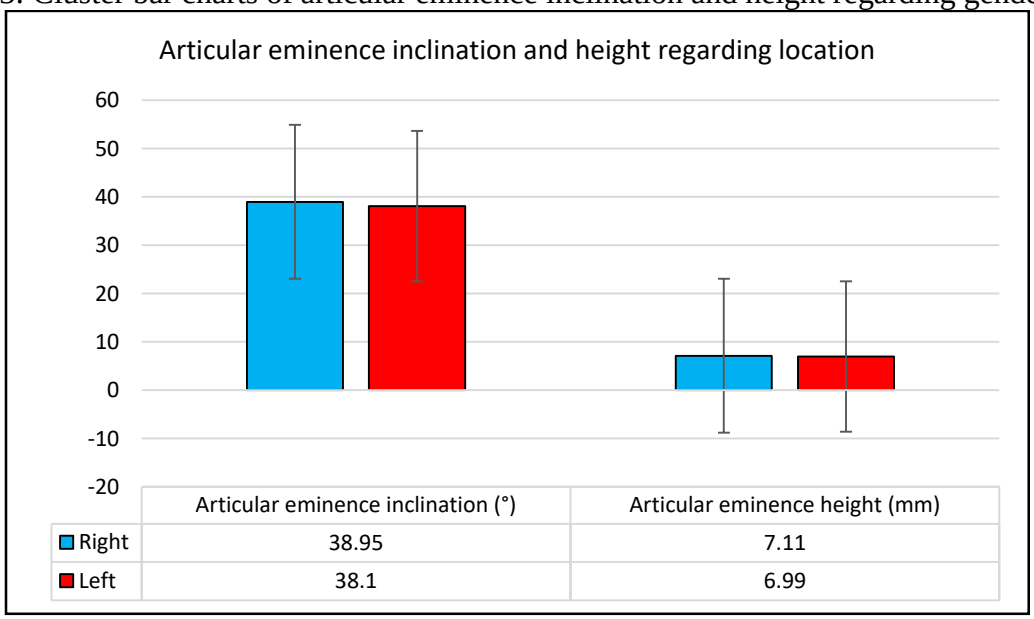

Figure 4: Cluster bar charts of articular eminence inclination and height regarding location.

DISCUSSION

The compound articular system identified as the temporomandibular joint (TMJ) is positioned between temporal bone and jaw. It can move in all three planes of space and usages a dynamic balancing system to allow mandibular functions. [10] The condylar process travels during mandibular motions crossways articular eminence (AE), portion of temporal bone. [11]. According to our findings, an adult have normal value ranges from 30° to 60° of AEI, these approve with Lobo et al., [12] they described an AEI for adults in normal value varying from 30° and 60°. Contrariwise, these findings seem to be situated significantly dissimilar from those informed in other researches. [9,13] and from 42° to 58° range that Arieta-Miranda designated. [14]. Our results show articular eminence inclination in sides right and left, males have verified higher mean value (right 40.73°, left 38.37°), than females (right 38.13°, left 37.75°), with a statistically non-significant relationship, this approve with study finished by Csadó et al., they institute that there were no variances by gender in eminence inclination. [6]. Also, the current study agree with study done by Abdul-Nabi and Al-Nakib. [15] They claimed that articular eminence inclination was unaffected by gender, while males mean eminence inclination values were higher than females with not statistically significant. These marginal discrepancies disagree the few research in literature that discovered difference in eminence inclination conferring to gender, [16,17,18,19] this may be clarified by the possibility that these variations are partly arbitrated by anatomical variations carried by sex hormones, which evident during adolescence,(10) as well as by the difference in functional force acting on TMJ between people (male and female). [17] . Paknahad et al. [20] employed method (top-roof line) and revealed that the mean±SD of the inclination of eminence in men was 34.56±6.210 and in women was 38.10±7.010. Nevertheless, in our investigation, the male eminence inclination as determined by method (top-roof line) was larger than female eminence inclination. These variations may be partially mediated by anatomical variations carried about by the dissimilar functional forces acting on the TMJ in male and female subjects. [17].

Similar to Csadó et al. [6] revealed, there were no statistically significant variances in mean angulation of AEs between the sides, right and left of the TMJ. Furthermore, Wu et al.(21) confirmed that there were no statistically significant variations between means of angles when comparing the sides, right and left in males and females. The asymmetrical distribution of biomechanical stresses resultant from the predominant usage of one side of the dental arches during chewing is possible the source of the discrepancy between the left and right joints. [10].

Males were revealed to have higher eminence inclination and height values than females in researches by Sümbüllü et al. [11] and Ilguy et al. [9] In a similar attitude, we revealed that men's eminence height values were larger than women's.

Our findings disagree with research conducted by Daniela Pita de Melo et al., [4] They appealed that the height and inclination (steepness) of articular eminence had been assessed. In two of three estimated studies (which used MRI rather than CBCT images) female patients had greater eminence height values.

CONCLUSION

Males have a steeper eminence than females. Height of eminence in male are higher than female.

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CONFLICT OF INTEREST

Nil

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