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Ultrasonograpic Evaluation for the Normal Disk Position of the Temporomandibular Joint

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Abstract: ***Background: Temporomandibular(TMJ) disorders is consider one of the most popular problems hence, a proper examination for the disc position is required. The purpose of this study was to assess the normal values oftemporomandibular joints disc position by ultrasonography. Material and method: Out of the total 34 TMJs from Seventeenth patients (13) were females and (4) were males requested for ultrasonographic scanning longitudinally (parallel to the ramus of the mandible) and transversally (parallel to the zygomatic arch) in both the closed- and open-mouth positions measuring the lateral capsule-condyle (LCC)distance and anterior capsule-condyle (ACC)distance. Results: for lateral capsule-condyle(LCC) distance the longitudinal scan with open mouth position mean distance was 1.479(±SD.495) compared to 1.359 (±SD.503) in closed mouth position, while in transverse scan the mean distance(LCC) in open mouth position was 1.929 (±SD.327) compared to 1.621 (±SD.471) in closed mouth position. Conclusion: ultrasonography isconsider as an alternative imaging technique tomonitor patients with TMJ disorders, particularly in assessing the normal values of (LCC) and (ACC) distances for temporomandibular joints disc position.***

Keywords: Ultrasonography, Temporomandibularm joint disk., normal values

1. Introduction

Temporomandibular joint (TMJ) is a large bicondylar joint consisting of the osseouscomponents which are the glenoid fossa and themandibular condyle, it also consisting of aflexible articular disc connected by ligaments and tendons that divide the articulationarea into superior compartments and inferior compartments. [1, 2]The disc position is defined asnormal when the location of the posterior portion is represented in the middle of 12 and 1 o'clock of thecondylar surface, while the position of disc is conceders displaced when an abnormal relationship between the articular disc with the glenoid cavity, condyle, and articular eminence exist. This conditioncan appear with or without reduction depending on the ability of the articular disc to returne back to normal position when the patients open their mouths. [3]
In the past, the main way for the diagnosis of any temporomandibular joint conditions was only by physical examination with the help of plain radiological examination. [4]Recently many imaging techniques have been introduced such as magnetic resonance imaging (MRI), computerized tomography (CT), panoramic radiography, arthrography, ultrasonography and, radionuclide imaging. All of this imaging modality is adjunctive methods for the diagnostic procedures, because case history and clinical examination of the patient are usually sufficient to reach for accurate diagnosis. [5, 6, 7]

Although (MRI) has been considered the gold standard for evaluation of temporomandibular joint disorders with about 95%accuracy of coronal and sagittal scans, but it has several disadvantages like highly costed, unavailability, and limitation of use in patients suffering of claustrophobia, metallic prostheses, and cardiac pacemakers. [8]

Now a day, ultrasonography (US) has been utilized as a new method to diagnose the normal and displaced position of TMJ disc, with the advantages of being inexpensive, noninvasive, widely available and repeatable. [9, 10, 11, 12]

2. Material and Method

Seventeenth patients (34 TMJs) diagnosed clinically with orofacial pain, without any previous history of disc displacement they are 13 females and 4 males; aged between 18 and 45years (mean of age=34.529, SD ±8.0240), requested for ultrasonography (US).

Ultrasonographic scanning was carried out with aB- mode gray scale, high- resolution real-time scanner of (6-12 MHz) linear array transducer)longitudinally (parallel to the ramus of the mandible) and transversally (parallel to the zygomatic arch) in both the closed- and open-mouth positions as the transducer manipulated along the surface of the skin that covers the examined TMJ. In each scan the distance between the most lateral point of the capsule and the most lateral point of the head of condyle wasmeasured (lateral capsule-condyle (LCC)distance)then, the distance between the most anterior point of the capsule and the most anterior point of the head ofcondyle measured (anterior capsule-condyle (ACC)distance).

The reports then were recorded as a meanvalues for the lateral capsule-condyle distancein the longitudinal (coronal) and transverse (axial) scans in both the closed- and open-mouth positions and the mean values for the anterior capsule-condyle distance in both the closed- and open-mouth positions only in transverse (axial) scans.

The normal positioned disc defined as an echogenic structure surrounded by a hyperechogenic line, representing the capsule according to (Elias et al, 2002) [9] identification. All patients were fully informed about the procedures before the beginning of the examination.

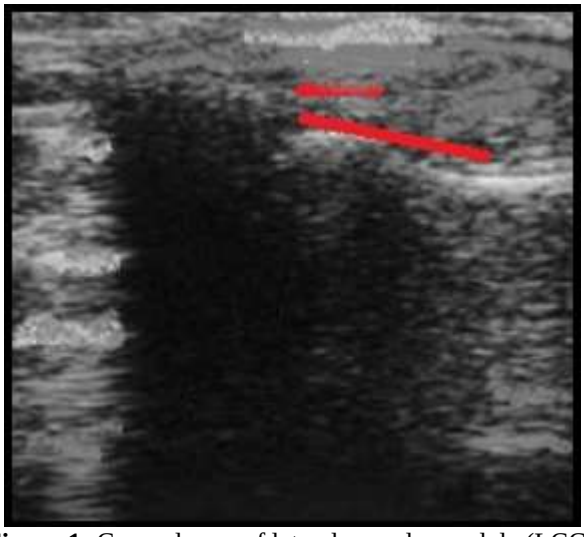

Figure 1: Coronal scan of lateral capsule-condyle (LCC) distance (closed mouth)

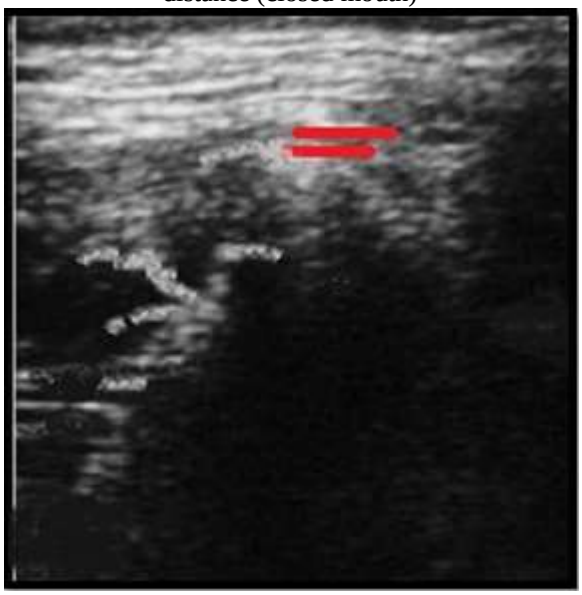

Figure 2: Axial scan of lateral capsule -condyle (ACC) distance (opened mouth)

3. Results

The total (43 TMJs) of 17patients were examined ultrasongraphically, for lateral capsule-condyle(LCC) distance the longitudinal scan with open mouth positionmean distance was 1.479(±SD.495) compared to 1.359 (±SD.503) in closed mouth position, while in transverse scan the mean distance(LCC) in open mouth position was 1.929 (±SD.327) compared to 1.621 (±SD.471) in closed mouth position.

Todetermine the mean differences betweenlongitudinal and transverse scantwopaired samples test was usedshowing high significant value, but with medium Effect Size (Cohen D test)(0.681) for longitudinal scan and large (1.048) for transverse scan. Although there was a strong positive correlation for both scans but it was higher longitudinally.

In anterior capsule-condyle (ACC) distance the transverse scanningshows high significant differences between open and closed mouth positionswith large Effect Size (Cohen D test) (1.757)and strong positive correlation.

Table 1: LCC distance in longitudinal and transverse ultrasonography scan

Ultrasonography Scan	*mouth position*	*Min.*	*Max.*	*Mean*	*±SD*	*Paired T #*	*R*	*Sig*	*Effect Size (Cohen D)*
Longitudinal Scan in LCC distance	Open	.70	2.40	1.479	.495	3.969	0.937	.000367	0.681 (Medium)
	closed	.50	2.40	1.359	.503				
Transverse Scan in LCC distance	Open	.70	2.30	1.929	.327	6.109	0.785	.000001	1.048(Large)
	Closed	1.00	2.40	1.621	.471				

Table 2: ACC distance in transverse ultrasonography scan

Ultrasonography Scan	*Mouthposition*	*Min.*	*Max.*	*Mean*	*±SD*	*Paired T #*	*R*	*Sig*	*Effect Size (Cohen D)*
Transverse scan in ACC distance	Open	1.50	3.70	1.353	.840	-10.248	0.595	.000000	1.757 (Large)
	Closed	.00	2.50	2.550	.590				

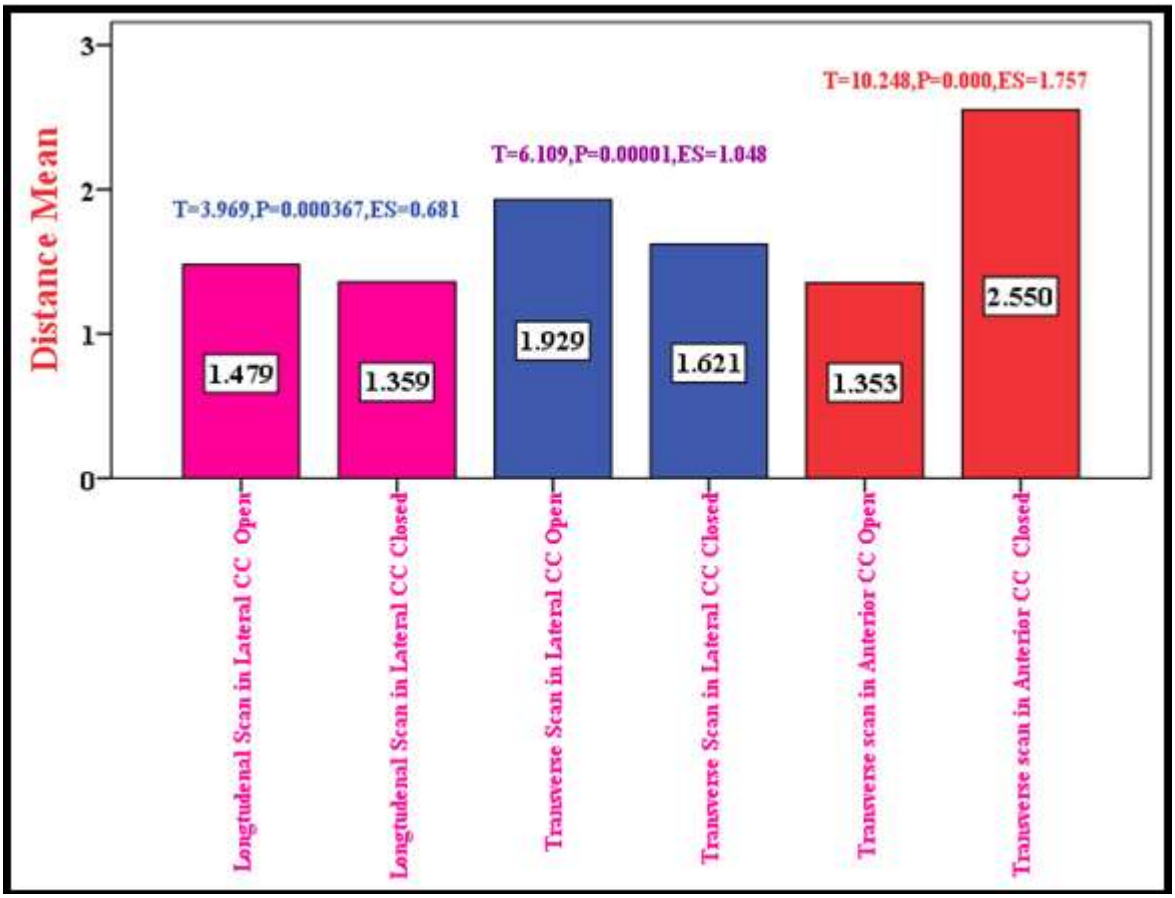

Figure 1: Bar chart showing the distance mean for LCC and ACC in both longitudinal and transverse scan

4. Discussion

Temporomandibular joint disorders have been reported to affect nearly 10-70% of population, so a proper diagnosis is required because these disorders mayaffect the quality of patient'slife.[13]

Many studies have describe the ultrasonography as a diagnostic tool for TMJ disorders due to its ability in evaluating theintegrity and correlation of the hard and soft tissues of the TMJ through static and dynamic assessments [14]. The principle of this study is depend onidentification of the disc positionrelative tothe condyle which was agree with Landes et al.(2000)[15], Hayashi et al. (2001) [10] they evaluate the anterolateral position of the disc as an indirect sign.

This study revealed that the averagevalues for the lateral capsule-condyle(LCC) distance inlongitudinal and transversescanning (1.4 mm to 2.0 mm)compared to(1.2 mm to1.6 mm) of Elias et al, 2002) [9] study, while in anterior capsule-condyle(ACC) distance transverse scanning the average is(1.3 mmto 2.5 mm) which was close tothe average of Elias et al, 2002) [9]study (1.1 mm to2.3 mm). The differences wasaccording to the direction of ultrasonography scanning and the position ofthe mouth

This study show that the visualization of the anterior portions of the articular capsule and mandibular condyle is mucheasier by using transverse scanning than in longitudinal scanning dependent on the tilting of the transducer. As a Conclusion The normal values for (LCC) and (ACC)distances in this study can be used as referencedata for further studies in this contextbecause some authors in previous studiesfaced some difficulty in detect the disc itself so they depending onexamining other anatomical landmarks asindirect signs for the position TMJ disc.

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