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Characteristics of articular fossa and condyle in patients with temporomandibular joint complaint

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Abstract. – OBJECTIVES: To investigate the temporomandibular joint (TMJ) characteristics of patients who have temporomandibular disorder complaints with multislice computed tomography imaging.

PATIENTS AND METHODS: Between January 2011 and March 2012, 37 patients whose age ranged from 18 to 60 years underwent Computed tomography imaging of the bilateral temporomandibular joints for TMJ complaints at our Institution. Twenty one patients without temporomandibular joint complaints serves as control group. Differences between the mean depths of the right and left side mandibular fossa and comparisons between patient and control groups were assessed by analysis student t test.

RESULTS: The age range of 37 patients (28 females and 9 males) was 18 to 60 (mean age: 37.5) years. The mean depths of the mandibular fossa were 8.56 ±0.8 mm and 8.71 ±0.7 mm for the right and left sides ($p < 0.05$). The mean anterior joint spaces were 1.92±0.6 mm and 2.10±0.7 mm for the right and left sides, respectively ($p > 0.05$). The mean superior joint spaces were 2.98±0.7 mm and 2.82±0.8 mm for the right and left sides ($p > 0.05$). The mean posterior joint spaces were 2.31±0.7 mm and 2.17±0.6 mm for the right and left sides, respectively ($p > 0.05$).

The mean values for the measurement of the anteroposterior (AP) diameter of the condylar process were 7.56±1.1 mm for the right side and 7.23±1.3 mm for the left side ($p > 0.05$). The mean values for the measurement of the mediolateral (ML) diameter of the condylar process were 16.97±2.1 mm for the right side and 17.17±2.7 mm for the left side ($p > 0.05$).

CONCLUSIONS: Measurements of mandibular fossa and joint space had not differ in patients of TJS (temporo joint space). But, AP and ML measurements of condyles were statistically difference between patients and controls.

Key Words:
Temporomandibular joint, Computed tomography, Diagnosis.

Introduction

The expression "temporomandibular disorders (TMDs)" is a collective term embracing a number of clinical problems that involve the masticatory musculature, the temporomandibular consists of patient history, physical evaluation and, in most chronic cases, behavioral joint (TMJ) and associated structures, or both[1]. The gold standard of diagnosis of TMDs consists of patient history, physical evaluation and, in most chronic cases, behavioral or psychological assessments. Treatment has been also planned based on symptoms such as dysfunction and/or pain[2].

Controversy exists over the value of the temporomandibular joint (TMJ) condylar position in the fossa. Many clinicians associate the concentric position to the normal individuals and the retruded position to the dysfunctional condition. The condylar position is an end product of many dynamic changes such as growth and remodeling, functional matrix activities, occlusal alteration[2]. It is suggested that diagnosis and treatment of TMJ disorders should not be based solely on the radiographics position of the condyle. Consideration of general body conditions is an essential part of total patient management. The optimal condylar position has been a controversial subject in dentistry for many years[3].

Several imaging techniques exist for evaluating the TMJ. X-Ray and panoramic imaging can be used for initial screening for osseous abnormalities and to rule out gross pathology such as fractures and advanced degenerative joint disease. Magnetic resonance imaging (MRI) provides optimal information about the disk and its relationship. Computed tomography (CT) is the imaging method of choice for the evaluation of the osseous anatomy and lesions of the TMJ[4].

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The purpose of this study was to emphasize the joint characteristics of patients with TMJ complaints, using multislice CT imaging technique.

Patients and Methods

Thirty seven patients (28 women, 9 men) with TMJ complaints such as TMJ pain during palpation, joint sounds, difficulty of jaw movements and chewing, underwent computed tomography (CT) imaging of the bilateral TMJs. Patients with a history of general arthritis or other connective tissue diseases, treatment with immunosuppressive drugs, any organ diseases, general infection, and trauma-induced joint disorders, age under 18 or over 60 years were excluded from the study.

Twenty one patients (15 women, 6 men) without TMJ complaints age ranged from 18 to 60 years serves as control group (Table I). The control group was comprised of patients with paranasal sinus tomography because of the TMJ could be viewed by paranasal CT. All patients were informed and provided written consent according to the principles presented in the Declaration of Helsinki. The study was approved by the Ethics Committee of Bozok University Medical Faculty. All patients were evaluated by multislice computed tomography examinations (MSCT; Philips Medical System, Brillance 64, Best, The Netherlands) in the supine position. After lateral scenograms, examinations consisted of 0.625 mm-thickness images with bone algorithms. Axial images were obtained for the TMJ and were constituted reformat coronal and sagittal images with bone and soft tissue algorithms. Depth of the mandibular fossa, anterior joint space, superior joint space and posterior joint space were determined based on sagittal plane images. The measurements of sagittal plane were performed from the most inferior point of auditory meatus. The greatest anteroposterior diameter of the mandibular condylar process and the greatest mediolateral diameter of the mandibular condylar process were described based on axial plane images[5,6] (Figure 1).

Table I. Demographic characteristic of all patients.

Characteristic		Value
Gender	Female	28
	Male	9
Age	Female	36.93 ± 15.6
	Male	39.50 ± 13.8
Joint	Right	19
	Left	18
Clinical characteristics	Pain during palpation	37
	Joint sound	13
	Difficulty of movements	11
	Denture	8

Statistical Analysis

The SPSS software program version 13.0 (SPSS Inc., Chicago, IL, USA) was used for data management and statistical analyses. Parameters were expressed as mean ± SD. Differences between the mean depths of the right and left side mandibular fossa and comparisons between patient and control groups were assessed by analysis student *t* test. Statistical significance was considered at $p < 0.05$.

Results

Between January 2011 and March 2012, 37 patients whose age ranged from 18 to 60 years

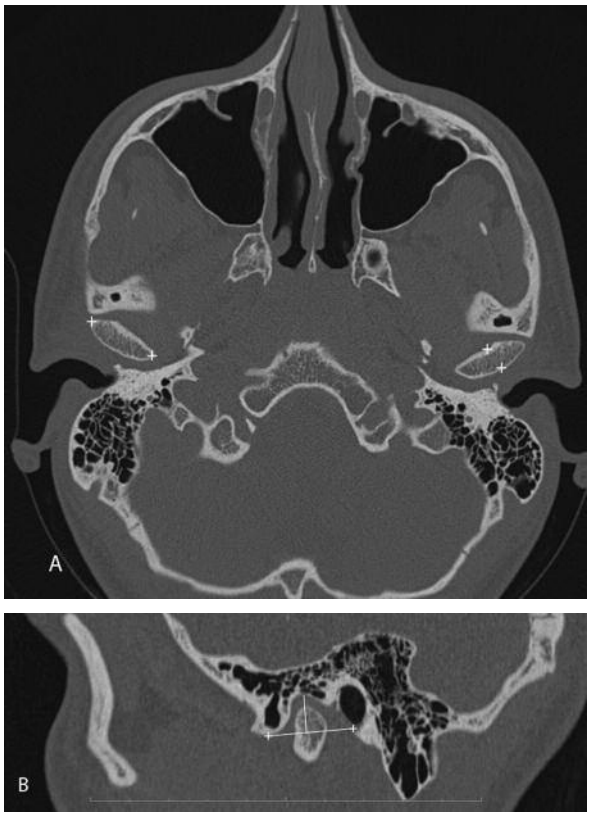

Figure 1. ***A,*** CT images; right, greatest mediolateral diameter of the mandibular condylar process; left, greatest anteroposterior diameter of the mandibular condylar process. ***B,*** CT images; depth of mandibular fossa.

(mean age: 37.5) underwent CT imaging of the bilateral TMJs for TMJ complaints at our Institution. Of these, 28 were female and 9 were male. Joint complaints of nineteen patients were at the right side and eighteen patients were at the left side. The descriptive statistics for each measurement are shown in Table II. The mean depths of the mandibular fossa were 8.56 ±0.8 mm and 8.71 ±0.7 mm for the right and left sides ($p < 0.05$). The mean anterior joint spaces were 1.92±0.6 mm and 2.10±0.7 mm for the right and left sides, respectively ($p > 0.05$). The mean superior joint spaces were 2.98±0.7 mm and 2.82±0.8 mm for the right and left sides ($p > 0.05$). The mean posterior joint spaces were 2.31±0.7 mm and 2.17±0.6 mm for the right and left sides, respectively ($p > 0.05$).

The mean values for the measurement of the anteroposterior diameter of the condylar process were 7.56±1.1 mm for the right side and 7.23±1.3 mm for the left side ($p > 0.05$). The mean values for the measurement of the mediolateral diameter of the condylar process were 16.97±2.1 mm for the right side and 17.17±2.7 mm for the left side ($p > 0.05$).

Discussion

The temporomandibular joint is a synovial joint which is formed by the condyle of the mandible, mandibular fossa and articular eminence of the temporal bone at the base of the skull[4]. Unlike most other joints of the body, which have cartilaginous coverings, the articulating surfaces of the TMJ are covered by a thin layer of dense fibrous tissue. Mediolateral dimension of condyle is approximately twice than anteroposterior dimension of condyle. Mandibular condyle is oriented perpendicular to the ramus of the mandible. The articular surfaces of condyle are smooth and the condyle is placed symmetrically in the fossa. The joint space is uniform[7]. The distribution of functional load may be different according to morphology of joint. Since, shape and function are closely related, it can be suggested that both the condyle and the mandibular fossa may differ in shape in subjects with various TMJ complaints[8].

TMJ pain and disfunction are common and important clinical problems[7]. Symptomatic TMJ dysfunction affects 28% of the adult population, of which a smaller, but significant, percentage experiencing severe impairment. It is estimated that 17,800,000 workdays are lost each year for every 100,000,000 full-time working adults in the United States due to disabling temporomandibular disorders[9]. The clinical problem is complex, because TMJ dysfunction is multifactorial.

Computed tomography (CT) is an excellent tool for evaluating the normal anatomy of TMJ. CT scanning can depict bony and soft-tissue changes that are not detectable using conventional radiography. CT scanning remains the gold standard for cross sectional anatomy of the TMJ[10]. Moreover, shorter scan times and reformatting techniques such as multiplanar reconstruction provide invaluable advantages over single section scanners[2]. CT is also frequently used for evaluation of potential pathology in the nearby tissues. Although MRI has certain advantages in evaluation of soft tissues, CT gives excellent information regarding the soft tissues and has the benefit of providing detailed images of the neighboring parts of temporal bone and skull base[4,10].

As a rule form and function are considered to be closely linked, within this context the morphology of the TMJ might be related to functional forces. Because the mandible and TMJ can be loaded differently in person with diverse dentofacial morphologies[11].

Table II. Scanning parameters for CT imaging (mm).

	Patient group			Control group		
	Right side mean ± SD	Left side mean ± SD	p	Right side mean ± SD	Left side mean ± SD	p
Depth mandibular fossa	8.56 ± 0.8	8.71 ± 0.7	> 0.05	9.09 ± 1.1	9.09 ± 1.1	> 0.05
Anterior joint space	1.92 ± 0.6	2.10 ± 0.7	> 0.05	1.9 ± 0.6	1.87 ± 0.6	> 0.05
Superior joint space	2.98 ± 0.7	2.82 ± 0.8	> 0.05	2.65 ± 0.6	2.51 ± 0.6	> 0.05
Posterior joint space	2.31 ± 0.7	2.17 ± 0.6	> 0.05	1.91 ± 0.5	1.85 ± 0.6	> 0.05
Mediolateral diameter of condylar process	16.97 ± 2.1	17.17 ± 2.7	> 0.05	18.38 ± 3.5	18.09 ± 2.3	> 0.05
Anteroposterior diameter of condylar process	7.56 ± 1.1	7.23 ± 1.3	> 0.05	7.93 ± 2.3	7.66 ± 1.0	> 0.05

Several papers pointed out that the relationships between the disc position and condyle position. Burley[12], evaluated the articular structures of the temporal bone in patients with different types of malocclusions (Classes I, II, and III) and showed that they do not produce functional stimuli capable of altering the contour of the anterior wall of the mandibular fossa. There has been limited information about the relationship between the clinical signs or symptoms and the condyle position.

Most studies aiming at the evaluating the TMJ by means of CT have considered malocclusion joint[5,6,13,14]. In this study, by using the same methods, comparison a statistical was performed between the findings obtained from the patients with temporomandibular joint syndrome and normal subjects. Christiansen et al[15] observed in their CT study that anterosuperior joint space was smallest in normal TMJ compared with the superior and posterosuperior joint space. Ikeda and Kawamura[16] found that noncentered condyles, with posterior joint space larger than the anterior joint spaces. In our study, we found that anterior joint space was smallest and superior joint space was largest in patients with TMJ complaints and controls statistically. There was no significant difference between the two groups.

The axial slice is the most appropriate approach to assess the symmetry between the condyles in the anteroposterior (AP) and mediolateral (ML) aspects**.** This also permits measuring the real dimensions of the condyles[1]. Our findings did not show statistically significant differences between the right and left condylar process. But, there was statistically difference between patients and controls in of AP and ML measurements of condyle. Measurements of condyle were found smaller in patient with TMJ complaints.

Condyle and fossa differ in shape among patients with malocclusion, that is still controversial. While some investigators showed correlations between these two variables, the others reported no relationship between them. The sagittal slice is the most appropriate for assessing the condyle-fossa relationship. The depth of the mandibular fossa can also be determined by this technique[1]. Our results showed no significant differences between the right and left sides for anterior, superior, posterior articular spaces and depth of fossa. This similarity can be explained because of the fact that it can be affected by the two sides, although patients have unilateral symptom.

All measurements of left joint were larger than measurements of right joint in patient with TJS. In contrast, measurements of left joint were smaller than right joint in controls. In our study, condyle irregularity was demonstrated in some subjects with of no clinical and statistical significance.

Conclusions

Measurements of mandibular fossa and joint space do not have any differences in patients of temporo joint spaces (TJS). However, AP and ML measurements of condyles were statistically difference between the patients and controls.

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