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Research Article

Evaluation of the Musculuskeletal Systems and Kinesiophobia of the Individuals with Temporomandibular Disorders

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Abstract

Objectives: The aim of this study was to investigate the temporomandibular joint mobility, cervical mobility, head position, and kinesiophobia in individuals who were seperated into different groups according to the Research Diagnostic Criteria for Temporomandibular Disorders, and were diagnosed with only one.

Methods: Individuals with temporomandibular disorders were divided into 3 groups according to the Research Diagnostic Criteria for Temporomandibular Disorders. After obtaining sociodemographic information of individuals, cervical mobility and head position with a goniometer, temporomandibular joint mobility with a ruler, and kinesiophobia with a Tampa Scale for Kinesiophobia were assessed.

Results: In the statistical analysis among the groups; values for the Tampa Scale for Kinesiophobia of individuals in group 3 were higher than the others with temporomandibular disorders (p=0.002); while head position, temporomandibular joint mobility and cervical mobility values did not differ (p>0.05).

Conclusion: It is considered that craniocervical symptoms can different in subgroups of temporomandibular disorders at the beginning. However, these symptoms were same in all groups, except kinesiophobia. On this basis, it is need for further study with high level of evidence.

Keywords: Head position, kinesiophobia, mobility, RDC/TMD, temporomandibular disorders

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Temporomandibular disorders (TMD) are musculoskeletal disorders in which masticatory muscles or temporomandibular joint (TMJ) are affected separately or together. TMD is a common problem in the community, because it affects functions such as eating and speaking and can cause important problems in the daily life of the patient.[1] The most common symptoms are blunt pain, pain in front of the ear, pain that can spread to the face, neck and head, tenderness in the masticatory muscles, clicking noise in the joints and limitation in jaw movements. In addition to these, head position and cervical mobility deterioration[2–4] and fear of movement (kinesiophobia)[5, 6] can be seen.

Studies have shown that postural problems involving the head and cervical spine may cause TMD.[7] It is also assumed that changes in neck and head posture can cause painful conditions and/or create susceptibility by altering the biomechanical balance and muscle balance in the craniocervical region.[8]

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The normal joint range of motion (ROM), supported by the literature, is an important feature of the normal function of a joint. Therefore, the performance of the stomatognathic system is directly related to the TMJ mobility.[9] Muscle pain and spasms and joint pain and/or joint dislocation commonly cause the restricted mandible ROM or vice versa.[10, 11] The reason for the limited movement is articular, extraarticular, or both.[12] In studies evaluating mandibular joint mobility, the maximal mouth opening was recorded as limited to less than 35 mm, the right and left excursion movement was limited to less than 7 mm, the protrusion was limited to less than 5 mm.[13] The amount of active and passive mouth opening and the jaw-locking story are important criteria in assessing the TMJ situation.[14]

The most common discomforts that generate from the noises of TMJ are its hypermobility or articular anterior disc displacement.[15] Sometimes these discomforts may cause stuck or locking feeling in the mandibular movements. In many cases, these are dangerless conditions that only require patient education.[16] Therefore, functional problems arising from the feeling of stuck and locked may cause abnormal motion patterns and kinesiophobia.[17] Kinesiophobia is defined as imparity and extravagantness in decreased mobility and fear of motion resulting from pain or susceptibility to reinjury, and fear avoidance.[18] Recent studies suggest that kinesiophobia is a predictor of craniofacial pain and disorder in patients with TMD.[5, 6]

In the literature, it has been indicated that TMD has been associated with head position,[2] kinesiophobia,[5] cervical and TMJ mobility.[19] However, there are no comprehensive studies comparing these measurements in different subgroups of TMD. Given these situations, the aim of this study is to examine head position, kinesiophobia, cervical and TMJ mobility in individuals who were divided different groups according to Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). It has been anticipated that TMJ mobility, cervical mobility, head position, and kinesiophobia may differ in different groups of TMD.

Methods

Sample Size

This study was carried out on 77 individuals who were admitted for the first time to the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Ondokuz Mayis University (OMU) between April 2017 and July 2017 and diagnosed with TMD by a Oral and Maxillofacial surgeon. Power analysis was performed by the statistician to determine the number of individuals included in the study. At the end of the power analysis, it was calculated that 90% power with 95% reliability could be obtained when at least 75 persons (at least 25 persons for each group) were included.

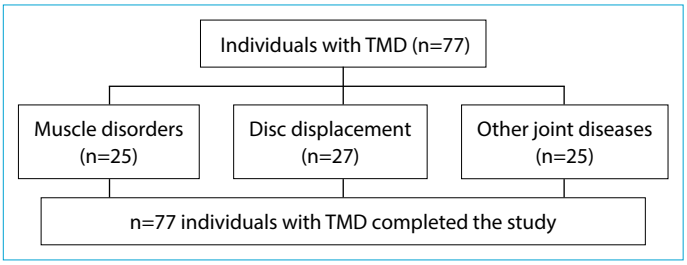

Figure 1. Individual flowchart.

The individuals who were included in the evaluation were separated into 3 groups according to RDC/TMD and radyographic, and clinical evaluation: the 1st group (n=25) with muscular disorders, the 2nd group (n=27) with disc displacement, and the 3rd group (n=25) with other joint diseases. Nobody dropped out during the assessment and 77 individuals completed the study (Fig. 1). The individuals who volunteered to participate in the study and placed in one of RDC/TMD group 1-2-3 classification were included in the study. Individuals with a history acute trauma and a history operation in TMJ those who were not placed one of the RDC/TMD classifications, those who had a neurologic or psychiatric disorder, a trigeminal or postherpatic neuralgia presence, and a dental or orofacial infection were excluded from the study.

The study was evaluated by Ondokuz Mayıs University, Clinical Studies and Ethical Committee (No: 2017/83), and accepted to be ethically appropriate. Each individual was informed on the methods and purpose of the study, and a voluntary consent form was signed on their participating in the study on their own accord. For individuals under 18 years old, a consent form was signed by one of the parents.

Individual Evaluation Form

For determining the sociodemographic properties of each individual, age, gender, height, weight, Body Mass Index (BMI), complaint periods, side of chewing, bruxism, and teeth malocclusion were questioned.

Temporomandibular Joint Mobility

TMJ mobility was recorded by measuring the distance between the maxillary and mandibular central incisors during TMJ movement. For the mouth opening is measured distance between the maxillary and mandibular central incisors during maximal mouth opening. For the lateral excursion movement is measured distance between the maxillary and mandibular central incisors during lateral sliding. For the protrusion movement is measured anteroposterior distance between the maxillary and mandibular central

incisors during front movement of mandibula. The mouth opening was limited to less than 35 mm, restricted to less than 7 mm in the right and left excursion movement, and limited to less than 5 mm in the forward movement-protrusion.[13] An average of three measurements were taken to reduce error rate.

Cervical Mobility

Cervical mobility was evaluated with universal goniometric measurement. In cervical flexion and extension measurement, the individuals sat next to the physiotherapist. Acromion was regarded as the pivot point. The stationary arm was kept parallel with the ground. The movable arm was calibrated in a way following the median line of armear, and the angle between flexion and extension motions of the individuals were measured. In the cervical lateral flexion measurement, the individuals sat with their backs facing the physiotherapist. The C7 spinal process was regarded as the pivot point. The stationary arm was kept parallel with the ground. While the movable arm followed the lines of the cervical vertebras, the individuals were asked to keep their head laterally, and the angle was measured. In the cervical rotation measurement, the individuals sat, and a long stick was placed in their mouth. The medium line of the head was regarded as the pivot point. The stationary arm was kept parallel with the ground. The movable arm followed the stick kept in the mouth. The angle between the motions of the individual was measured. The measurements were recorded in degrees. An average of three measurements was taken to reduce the error rate.

Head Position

The head position was assessed with a universal goniometer. The head posture of the head was measured as the angle between the horizontal plane and the ear by taking the pivot point of the seventh cervical vertebra (C7) line.[19] Individuals sat in comfortable and natural positions. The C7 was localized with manual palpation. When the C7 was taken as the pivot point, the goniometer was held parallel to the horizontal plane and the moving arm was positioned to the external auditory meatus. The angle among the ear, the C7 and the horizontal plane was measured.[20, 21] An average of three measurements was taken to reduce the error rate. Studies by Visscher and Armijo-Olivo have shown that this method has consistency.[22, 23]

Kinesiophobia

The presence of kinesiophobia in TMJ of individuals was investigated using the Tampa Scale for Kinesiophobia (TSK). TSK was a control list including 17 questions. In the scale, 4-point likert scoring (1=I Totally Disagree, 4=I Totally Agree) was used. After reversing the 4th, 8th, 12th, and 16th items, the total score was calculated. The individuals had total scores between 17 and 68. A high score of the individuals in the scale indicated high kinesiophobia. The total score has been suggested to be used in studies. The study on Turkish validity and reliability of TSK was carried out.[24]

Statistical Analysis

Statistical evaluation of the data was performed using the Statistical Package for the Social Sciences (SPSS) version 22.0 software for Windows (SPSS Inc., Chicago, IL, USA). The continuous variables were expressed as average±standard deviation and the categorical variables were expressed as number and percentage. Whether the variables were appropriate to normal distribution or not was analyzed with the Shapiro-Wilk test. One-way ANOVA was used to compare independent group differences when parametric test assumptions were provided, and Kruskal Wallis ANOVA was used to compare independent group differences when parametric test assumptions were not provided. The Wilcoxon Test and the Paired Two-Sample Test were used for additive group comparisons. The differences between categorical variables were also analyzed using the chi-square analysis. In all analyses, $p<0.05$ was accepted to be statistically significant.

Results

A total of 77 individuals were included in the study which were classified according to the RDC/TMD as only muscle disorders [group 1 (n=25)], only disc displacement [group 2 (n=27)], or only osteoarthritis or osteoarthrosis [group 3 (n=25)]. In order to ensure homogeneity in the groups, the individuals who were diagnosed with only one disorder were included. For the consistency of the assessment, individuals diagnosed with more than one disorder were excluded.

Descriptive statistical values related to age, gender, weight, height, BMI, and some symptoms of the individuals were presented in Table 1. A total of 77 individuals in the study were female 59 (76.62%), male 18 (23.38%). Average age of all of them was 32.69±13.64. When age according to the groups were analyzed, ages of the individuals in group 3 were noticed to be significantly higher rather than the ones in group 1 and group 2 ($p<0.001$). The high that was age of individuals in group 3 with osteoarthritis and osteoarthrosis was a expected outcome. There was no difference between the three groups in weight, height and BMI of values. In terms of presence of bruxism was seen difference among groups. This difference were derived from group 1. Dysfunctions associated with muscle disorders can considered dependent to bruxism ($p>0.05$, Table 1).

Table 1. Descriptive data related to age, weight, height, BMI and some symptoms of individuals

	Muscle disorders (n=25)		Disc displacement (n=27)		Other common diseases (n=25)		Total (n=77)		p
	n	%	n	%	n	%	n	%	
Age (year) Mean±SD	25.52±7.61		24.59±7.82		48.6±8.62		32.69±13.64		**0.0001***
Gender									
Female	16	64	21	77.78	22	88	59	76.62	0.132
Male	9	36	6	22.22	3	12	18	23.38	
Kilogram (kg) Mean±SD	65.44±12.57		65.26±13.69		70.36±12.92		66.97±13.12		0.295
Height (cm) Mean±SD	167.96±10.29		165.52±6.9		161.88±8.67		165.13±8.92		0.118
BMI (kg/m^2) Mean±SD	23.18±3.69		23.66±4.05		25.77±4.33		24.19±4.13		0.059
Complaint period (month) Mean±SD	22.36±36.62		19.78±29.96		20.12±36.45		20.73±33.93		0.91
Side of disorder									
Right	5	20	10	37.04	5	20	20	25.97	
Left	7	28	11	40.74	13	52	31	40.26	0.111
Bilateral	13	52	6	22.22	7	28	26	33.77	
Presence of bruxism									
Yes	19	76	12	44.44	12	48	43	55.84	**0.046***
No	6	24	15	55.56	13	52	34	44.16	
Teeth malocclusion									
Yes	22	88	22	81.48	22	88	66	85.71	0.744
No	3	12	5	18.52	3	12	11	14.29	
Side of chewing									
Right	12	48	13	48.15	9	36	34	44.16	
Left	7	28	7	25.93	11	44	25	32.47	0.682
Bilateral	6	24	7	25.93	5	20	18	23.38	

*p<0.05 statistically significant difference; BMI: Body mass index; SD: Standard deviation; kg: Kilogram; cm: Centimeter; kg/m^2: Kilogram/Meter^2.

Table 2. Comparison of data related to TMJ mobility parameters of the individuals in groups

	Muscle disorders (n=25) Mean±SD	Disc displacement (n=27) Mean±SD	Other joint disorders (n=25) Mean±SD	Total (n=77) Mean±SD	p
Maximum mouth opening (mm)	35.16±7.8	35.89±11.13	32.2±9.92	34.45±9.76	0.228
Lateral excursion (mm) (right)	5.36±3.08	6.78±2.49	5.68±2.9	5.96±2.85	0.213
Lateral excursion (mm) (left)	6.12±2.79	7.04±2.72	6.04±3.26	6.42±2.93	0.395
Protrusion (mm)	4.76±2.42	4.52±2.19	4.4±2.61	4.56±2.38	0.865
Retrusion (mm)	1.48±1	1.78±1.15	1.48±1.16	1.58±1.1	0.443

*p<0.05 statistically significant difference; TMJ: Temporomandibular joint; SD: Standard deviation; mm: Millimeter.

Table 2 displays the results of the TMJ mobility parameters of the individuals in groups. It did not differ in terms of TMJ mobilities of individuals among the groups (p>0.05, Table 2).

Data related to cervical mobility parameters of the individuals in groups were presented in Table 3. It did not differ in terms of cervical mobilities of individuals among the groups (p>0.05, Table 3).

It was shown that there was no significant difference among the groups in the head position angle (p=0.52) while kinesiophobia values of individuals in group 3 were higher than the other groups (p=0.002), in Table 4.

Discussion

Results of the present study to investigate TMJ mobility, cervical mobility, head position and kinesiophobia in patients with TMD in different groups according to RDC/TMD did not differ in terms of TMJ mobility, cervical mobility or head position in patients with TMD, while kinesiophobia showed a difference.

It has been shown that 71% of individuals with TMD have craniocervical dysfunction, and 67% of them have restricted movement in the C1-2-3 segments.[25] In the present study, it was found that the angular averages of head positions

Table 3. Comparison of data related to cervical mobility parameters of the individuals in groups

	Muscle disorders (n=25) Mean±SD	Disc displacement (n=27) Mean±SD	Other joint disorders (n=25) Mean±SD	Total (n=77) Mean±SD	p
Cervical flexion (°)	33.16±8.43	35±8.86	30.84±8.31	33.05±8.61	0.221
Cervical extension (°)	15.92±6.13	15.07±5.81	17.04±7.9	15.99±6.62	0.713
Cervical rotation (°) (right)	59.48±8.58	54.22±10.74	54.08±12.5	55.88±10.88	0.312
Cervikal rotation (°) (left)	60.12±8.99	54.56±10.13	56.2±10.57	56.9±10.07	0.141
Cervical lateral flexion (°) (right)	22.24±6.02	22.3±4.71	23.92±6.51	22.81±5.74	0.536
Cervical lateral flexion (°) (left)	24.68±7.63	25.11±6.69	24.8±7.27	24.87±7.1	0.975

*p<0.05 statistically significant difference; SD: Standard deviation; °: Degree.

Table 4. Comparison of data related to head position and kinesiophobia parameters of the individuals in groups

	Muscle disorders (n=25) Mean±SD	Disc displacement (n=27) Mean±SD	Other joint disorders (n=25) Mean±SD	Total (n=77) Mean±SD	p
Head position (°)	44.76±5.47	45.04±6.22	43.88±6.97	44.57±6.18	0.521
TSK (Kinesiophobia)	41.52±4.46a	42.11±4.7a	45.68±3.47	43.08±4.58	**0.002***

*p<0.05 statistically significant difference; SD: Standard deviation; TSK: Tampa Scale for Kinesiophobia; °: Degree.

of individuals with TMD were lower than those in the literature.[22, 23] The increase in head position angle can lead to an increase in the anterior tilt of the head while the decrease in head position angle can lead to straightening of the cervical spine. Both conditions are predisposing factors for TMD because they can cause muscle imbalance. It is thought that the changes in the head position seen in TMD individuals should be examined in detail and the head posture should be evaluated in terms of treatment. Individuals with TMD should be given appropriate exercises on head position and postural regularity.

In the current study, we observed that TMJ mobility of individuals with TMD was limited. There was no difference among our groups with muscle disorders, disc displacement, and other joint diseases in terms of maximum mouth openings. In addition, there also were no differences in quantities of the right and left lateral excursions, protrusion, and retrussion. Walker et al.[26] investigated the clinical features of individuals with TMD and maximum mouth opening of them was recorded as limited in their study. De Paula Gomes et al.[27] investigated the vertical movement of the mandible in young adults with and without TMD (diagnosed according to RDC/TMD), and found no significant difference between the groups. Bonjardim et al.[9] reported no significant difference in maximum mouth opening and lateral opening between the study group and the control group with TMD symptoms in their study. In the present study, it was thought that kinesiophobia and pain were able to affect maximal mouth opening of the individuals in group 3. Reason of this condition could osteoarthritis related to bone degeneration.This supposition must examine with further research. As a result of the current study, there was no difference in cervical mobility between the groups. However, cervical joint movements of individuals with TMD found to be very limited compared to normal values.[28] In all groups, cervical rotation was within normal limits although cervical flexion, extension, and lateral flexion values were limited. These values suggested that the movement of lower cervical segments relative to the upper cervical segments decreased. Based on this, the exercise and mobilization techniques necessary to increase cervical region function of individuals with TMD should be added to the physiotherapy program.

Gil-Martinez et al.[5] divided individuals with TMD into three groups in their study and kinesiophobia levels were found similar in all groups. He et al.[29] also evaluated kinesiophobia by separating three groups of individuals with TMD in their study and found that kinesiophobia of individuals were high. In the present study, the mean of the kinesiophobia of all individuals with TMD is above the mean values stated in the literature.[5] There was a difference among the groups in terms of kinesiophobia values. Kinesiophobia values of individuals in muscle disorders and disc displacement groups were similar while kinesiophobia values of the group 3 were higher than the other two groups. As a cause of this, it is conceivable that the TMJ mobility of the individuals in group 3 is more limited. It is thought that the sounds arising from the joint due to joint degeneration also cause kinesiophobia in individuals. Aging can also influence this outcome. Kinesiophobia

could more high in other joint disases group because of degenerative process. This suggested that patients with osteoarthritis and osteoarthrosis had worse prognosis than the other two groups.

The fact that we did not have a control group is a limitation of this study. Differences with the control group should be made clearer. However, the study was conducted with consideration that the parameters mentioned were affected in individuals with TMD. Studies should also be conducted on the control group. Another limitation is that measurement methods are subjective. There is a need for extensive studies to be done with more objective measurements.

Conclusion

In conclusion, in regard to current study it is considered that craniocervical symptoms can different in subgroups of TMD at the beginning. However, these symptoms were same in all groups, except kinesiophobia. On this basis, it is need for further study with high level of evidence.

Disclosures

Ethics Committee Approval: The study was evaluated by Ondokuz Mayıs University, Clinical Studies and Ethical Committee (No: 2017/83), and accepted to be ethically appropriate.

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