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Condylar Asymmetry Measurements in Patients with Temporomandibular Disorders

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Abstract

Objectives: The relationship between condylar asymmetry and handedness of the patients with temporomandibular disorders (TMD) and patients with no signs or symptoms of TMD was investigated. The experimental group consisted of 25 patients aged 15 to 52 years who were referred for treatment of TMD. The mean age of this group was 26.24 years. The control group consisted of 25 patients aged 14 to 52 years (mean age: 26.16 years).

Methods: The formula by Habets et al.[14] was used to express the symmetry between the condyles and the rami on the orthopantomogram (OPG) image. Differences between bothgroups and subgroups (condyle, ramus, condyle plus ramus) regarding symmetry were calculated with the Student's t-test.

Results: The mean of condylar asymmetry was found to be 11.11 ± 11.03% in the TMD group. However, in the control group, the mean of condylar asymmetry was found to be 8.36 ± 6.27%. No statistically significant differences were found between condylar asymmetry in both groups ($p>0.05$).

Conclusions: No statistically significant differences were found between condylar asymmetry index in patients with TMD according to myogenous problems and in patients with no signs or symptoms of TMD.

Keywords: Condylar asymmetry, TMD, TMJ

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Introduction

Condylar asymmetry (the comparison of vertical condylar height between right and left mandibular condyles) has been used to validate clinical tests of diagnostic categories in patients with temporomandibular disorders (TMD).[1] The aetiology of TMD is thought to be multifactorial[2,3], with muscle hyperactivity believed to be an important factor[4-6]; stress[7-9], parafunction[10], and arthrogenous factors[11] may also be related factors.

Condylar asymmetry has been related to overloading of the articular surfaces of the TMJ and it affects on the soft and hard tissue component of this surface, particularly the undifferentiated mesenchymal cell layer.[12] The articular surface of the joint may be overloaded due to muscle hyperactivity, and this has led to a suggested reason for the progression to osteoarthrosis in these patients.[5,13] Overloading of the articular surface leads to thickening of the soft tissue component. As a result, there is an increase in the condylar asymmetry which leads to greater muscle hyperactivity. This process can continue until the adaptive capacity of the surface is exceeded.[11] At this point, the TMJ problems occur.

The purpose of this study was to examine the relation of condylar asymmetry index in dentate patients with TMD according to overloading as well as premature contact points, bruxism, chewing on the same side, and in patients with no signs or symptoms of TMD.

Methods and Materials

Two groups of patients were selected at the Süleyman Demirel University, Faculty of Dentistry, Isparta. The experimental group consisted of 25 patients (20 females and 5 males) who were referred for treatment of TMD with a primary myogenous problem. Mean age of the TMD group was 26.24 years, with a range of 15 to 52 years. The control group consisted of 25 patients (20 females and 5 males) with no signs or symptoms of TMD. Mean age of this group was 26.16 years, with a range of 14 to 52 years. All were dentate with only one missing tooth allowed, other than third molars.

Since orthopantomograms (OPGs) are routinely used as a screening procedure in this clinic, all subjects (50) had OPGs available for review. All were exposed with a PM 2002 CC panoramic

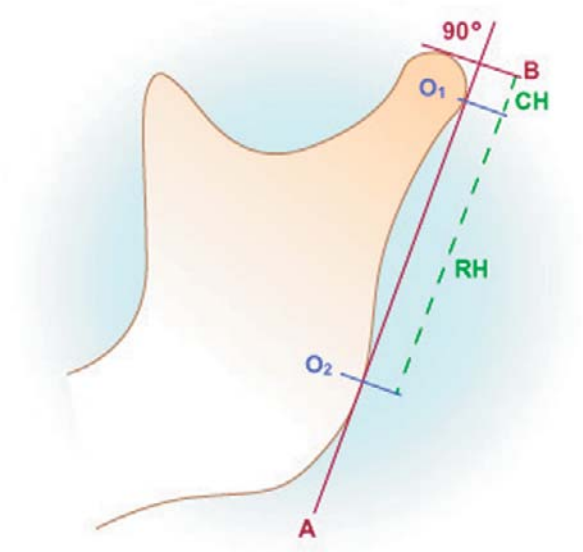

Figure 1.

O_1 & O_2 = Most lateral points of the image.
A = Ramus Tangent
B = Perpendicular line from A to the most superior part of the image.
CH = Condylar Height
RH = Ramus Height

apparatus (Planmeca Co., Helsinki-Finland), which had been standardized previously. All radiographs were taken in a standard manner by the same operator. The outlines of the condyle and the ascending ramus of both sides were traced on acetate paper. On the tracing paper, A-line was drawn between the most lateral points of the condylar image (O_1) and of the ascending ramus image (O_2) (Figure1). To the A-line (the ramus tangent) from the most superior point of the condylar image a perpendicular B-line was drawn. The vertical distance from B-line on "the ramus tangent" to the O_1 projected on the ramus tangent was measured. This distance was called the condylar height (CH). The distance between the O_1 and O_2 was called the ramus height (RH) and measured (Figure1).

To express the symmetry between the condyles and the rami on the OPG image, the following formula was used:[14]

Asymmetry Index (AI) =

$$CH_{right} - CH_{left} / CH_{right} + CH_{left} \times 100$$

Differences between experimental and control groups and subgroups (condyle, ramus, condyle plus ramus) regarding symmetry were calculated with the Student's t-test.

Results

Sex, age, and asymmetry index for each group is recorded in Table 1 and Table 2. The mean age of the TMD group was 26.24 years with an age range of 15-52 years. The mean of condylar asymmetry was found to be 11.11%, with a standard deviation of 11.03%. The mean of ramus asymmetry was found to be 3.07 ± 1.60%, and the mean of condylar plus ramus asymmetry was 2.96 ± 1.87% (Table 3).

The mean of the control group was 26.16 years with an age range of 14-52 years. The mean of condylar asymmetry was found to be 8.36 ± 6.27%. The mean of ramus asymmetry was found to be 3.08 ± 2.06%, and the mean of condylar plus ramus asymmetry was 2.64 ± 1.88%. No statistically significant differences were found between age, condylar asymmetry, ramus asymmetry, and condylar plusramus asymmetry of the experimental and control groups ($p>0.05$) (Table 3).

Table 4 depicts the asymmetry index and handedness in a group of patients with TMD.

Table 1. Sex, age, asymmetry index, and handedness in experimental group.

Sex	Age (years)	CH%	RH%	CH%+RH%	Handedness
Female	22	0.00	-2.65	-2.20	Both
Female	23	-4.55	-2.17	-2.20	Both
Female	27	-10.53	-3.13	-4.35	Left
Female	37	-23.08	3.13	-2.86	Left
Female	32	0.00	-2.88	-2.50	Right
Female	35	-3.45	-1.69	-1.94	Right
Female	36	-4.35	-6.15	-5.78	Both
Female	39	-5.88	0.55	-0.47	Left
Female	36	-12.82	-1.98	-3.73	Left
Female	19	13.04	6.47	7.14	Left
Female	15	-26.32	-1.55	-3.77	Left
Female	15	-17.24	3.83	1.42	Left
Female	16	-16.67	-4.35	-5.63	Both
Female	17	0.00	-2.86	-2.48	Left
Female	18	-4.76	-4.59	-4.62	Left
Female	19	0.00	1.05	0.85	Right
Female	36	-5.88	-2.46	-2.77	Left
Female	36	31.25	-2.91	1.68	Left
Female	41	-6.67	-4.52	-4.80	Right
Female	52	-12.50	5.05	2.61	Left
Male	15	-12.82	4.95	2.07	Right
Male	16	25.93	-2.91	0.43	Left
Male	17	0.00	1.55	1.44	Both
Male	20	0.00	0.51	0.43	Both
Male	17	-40.00	-2.98	-5.88	Left

Table 2. Sex, age, and asymmetry index in control group.

Sex	Age (years)	CH%	RH%	CH%+RH%
Female	23	6.12	0.00	1.27
Female	23	4.00	3.16	3.33
Female	27	2.56	-6.28	-4.88
Female	37	-7.32	-1.01	-2.09
Female	32	-8.11	4.40	2.28
Female	35	-17.95	-1.59	-4.39
Female	36	-9.09	-4.08	-4.59
Female	39	-14.29	0.60	-2.39
Female	37	2.13	-4.08	-2.88
Female	20	0.00	-4.46	-3.41
Female	14	4.76	-4.95	-3.28
Female	15	-16.67	1.94	-0.83
Female	16	5.56	-8.29	-6.22
Female	17	9.09	6.67	6.93
Female	18	6.67	-2.75	-1.61
Female	18	-14.29	1.42	0.00
Female	34	-6.67	-3.35	-3.77
Female	34	2.70	2.94	2.90
Female	41	2.86	-2.70	-1.82
Female	52	3.03	-1.96	-0.80
Male	15	23.81	1.96	4.00
Male	16	-12.00	1.33	0.00
Male	17	-7.14	1.04	0.00
Male	19	2.22	-1.31	-0.73
Male	19	20.00	-4.76	-1.50

Table 3. The calculated symmetry of the ramus and condylar heights expressed in percentages according to the formula by Habets et al.[14] (1988) in the experimental and control groups.

	GROUPS									
Asymmetry	Experimental (TMD)				Control (no signs of TMD)				t	Significance
	Mean	SD	Min	Max	Mean	SD	Min	Max		
CH%	11.11	11.03	0.00	40.00	8.36	6.27	0.00	23.81	1.16	p>0.05
RH%	3.07	1.60	0.51	6.47	3.08	2.06	0.00	8.29	0.02	p>0.05
CH+RH%	2.96	1.87	0.43	7.14	2.64	1.88	0.00	6.93	0.81	p>0.05
Age	26.24 ± 10.68				26.16 ± 10.58				0.46	p>0.05

Table 4. Table for the sign of the asymmetry index and handedness in a group of patients with TMD.

	Right handed	Left handed	Both sides handed	TOTAL
Right condylar height greater	0	3	0	3
Left condylar height greater	3	10	3	16
Right condylar height = Left condylar height	2	1	3	6
TOTAL	5	14	6	25

Discussion

Condylar asymmetry has been used to validate clinical tests of diagnostic categories in patients with TMD.[11] Some studies investigated the relationship between condylar asymmetry and age in patients with TMD.[11,15,16] Miller[11] and Miller et al.[5] have reported the experimental group with TMD showed a correlation, while the control group with no signs or symptoms of TMD showed no correlation between condylar asymmetry index and age. However, Miller and Bodner[15] and Miller and Smidt16 have shown no correlation was found between condylar asymmetry index and age in the group of patients with Angle's Class II division 2 and Class III malocclusions. When the condylar asymmetry/age relationship was investigated, it was found patients with a myogenous problem showed a parabolic curve, while those with an arthrogenous problem showed a linear curve.[5,11] In the present study, the symptoms and signs were questioned and examined according to myogenous problems. The relationship between myogenous and arthrogenous factors was not investigated in this study.

In the current study, the mean of asymmetry index for the experimental group, namely 11.11%, was lower than that reported by Miller.[11] He reported a value of 18.76%, and the mean age of that group was 25 years, while the mean age of our TMD group was 26.24 years. However, the mean asymmetry index of our TMD group was higher than that reported by Habets et al.[14] They reported a value of 7.3% for patients with an arthrogenous origin of pain in a group of patients with craniomandibular disorders. The mean age of that group was 35.5 years. This higher value may reflect the age and origin differences between the two groups. There appears to be a negative correlation between age and asymmetry index. This may be due to a greater depletion of mesenchymal cells with increasing age. This depletion has been postulated as a possible reason for osteoarthritic manifestations in the TMJ.[12]

References

1. Miller VJ. Condylar asymmetry and handedness in patients with temporomandibular disorders. J Oral Rehabil. 1997 Jul;24(7):549-51.
2. Greene CS, Laskin DM. Long-term status of TMJ clicking in patients with myofascial pain and dysfunction. J Am Dent Assoc. 1988 Sep;117(3):461-5. Erratum in: J Am Dent Assoc 1988 Oct;117(5):558.
3. [No authors listed] Treatment of temporomandibular disorders in children: summary statements and recommendations. American Academy of Pediatric Dentistry University of Texas Health Science Center at San Antonio Dental School.
   J Am Dent Assoc. 1990 Mar;120(3):265, 267, 269. Review. No abstract available.
4. Haber JD, Moss RA, Kuczmierczyk AR, et. al. Assessment and treatment of stress in myofascial pain-dysfunction syndrome: a model for analysis. J Oral Rehabil. 1983 Mar;10(2):187-96.
5. Miller VJ, Myers SL, Yoeli Z, et. al. Condylar asymmetry and its relation to age in a group of patients with a craniomandibular disorder of myogenous origin. J Oral Rehabil. 1994 Nov;21(6):707-11.
6. Schiffman EL, Fricton JR, Haley D. The relationship of occlusion, parafunctional habits and recent life events to mandibular dysfunction in a non-patient population. J Oral Rehabil. 1992 May;19(3): 201-23.
7. Mercuri LG, Olson RE, Laskin DM. The specificity of response to experimental stress in patients with myofascial pain dysfunction syndrome. J Dent Res. 1979 Sep;58(9):1866-71.
8. Perry HT, Lammie GA, Main J, et. al. Occlusion in a stress situation. J Am Dent Assoc. 1960 May;60:626-33. No abstract available.
9. Yemm R. A comparison of the electrical activity of masseter and temporal muscles of human subjects during experimental stress. Arch Oral Biol. 1971; 16: 269-273
10. Moss RA, Lombardo TW, Villarosa GA, et. al. Oral habits and TMJ dysfunction in facial pain and non-pain subjects. J Oral Rehabil. 1995; 22: 79-81.
11. Miller VJ. The effect of age on condylar asymmetry in patients with craniomandibular disorders of arthrogenous origin. J Prosthet Dent. 1992 Jun;67(6):845-6.
12. Hansson TL, Nordstrom B. Thickness of the soft tissue layers and articular disk in temporomandibular joints with deviations in form. Acta Odontol Scand. 1977;35(6):281-8. No abstract available.
13. Christensen LV. Jaw muscle fatigue and pains induced by experimental tooth clenching: a review. J Oral Rehabil. 1981 Jan;8(1):27-36. Review.
14. Habets LL, Bezuur JN, Naeiji M, et. al. The Orthopantomogram, an aid in diagnosis of temporomandibular joint problems. II. The vertical symmetry. J Oral Rehabil. 1988 Sep;15(5):465-71.
15. Miller VJ, Bodner L. Condylar asymmetry measurements in patients with an Angle's Class III malocclusion. J Oral Rehabil. 1997 Mar;24(3):247-9.
16. Miller VJ, Smidt A. Condylar asymmetry and age in patients with an Angle's Class II division 2 malocclusion. J Oral Rehabil. 1996 Oct;23(10):712-5.

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