

The Relationship between Handedness and Chewing Side

Yerda ÖZKAN^{1*}, Özlem SAHİN ATA¹, Recep ORBAK¹

Department of Periodontology, Ataturk University, Faculty of Dentistry, Erzurum, Republic of Turkey.
yerdaoalkan@hotmail.com

**Corresponding Author:* Yerda Ozkan, DDS, Faculty of Dentistry, Atatürk University, Department of Periodontology Erzurum, Republic of Turkey.

Abstract

Objective: Chewing side preferences is a factor that could be associated various functional or postural lateral preferences. The purpose of this study was to determine the preferred chewing side and whether chewing side preference is related to handedness.

Design: Thirty-six participants were included in this study. All participants have at least 28 teeth (except third molar) and class I occlusion and have no tooth pain and periodontal problems. Edinburgh handedness inventory test was used for determining hand using side. For chewing side determining, the patients chewed little cracker three times and their chewing move was recorded with a video camera, it was determined by following the video.

Results: Fourteen subjects chewed on the right, twelve on the left and ten chewed on both sides. We found that there was no significant relationship between preferred chewing side and handedness. Also no significant correlation was seen between the preferred chewing side and handedness.

Conclusion: In our study we showed that chewing side preference in a dentate population is not related to handedness.

Keywords: Chewing side, Handedness, Cerebral lateralization

INTRODUCTION

Mastication or chewing, is a rhythmic function, that comprising the coordinated action of peripheral effector organs, sensory input and the central nervous system.^{1, 2} Chewing can occur bilaterally, but it is supposed that most individuals use left or right side more than the other in the process of chewing function, that is termed chewing side preference (CSP).^{3, 4}

CSP is occur while mastication is consistently or predominantly performed on the same side, the fact remains that the factors affecting CSP are not exactly clear. There are diversified considerations about whether CSP is regularized centrally or peripherally. It has been alleged that chewing side preference is an innate, centrally controlled quality and affected by social and individual learning and dental parameters do not affect the CSP.^{1, 2, 5} All the same, it is also informed that partial prosthesis, the existence of pain, food texture and caries, asymmetric tooth loss,

zones of functional occlusal contacts, deciduous and mixed dentition are correlated with CSP.^{1, 3, 6-10} Furthermore, the detection of CSP may be influenced by measurement technique. Assignment of CSP can be performed by direct visual inspection or by indirect evaluation of images recorded with a video camera, a kinesiograph, or an electromyograph.¹¹⁻¹⁴ In addition to these, various types of test food including chewing gum, carrots, almonds and other foods have been utilized to detect CSP. It is known that, muscle activity and the chewing cycle were affected by the size, texture and hardness of the bolus.^{3, 4, 7, 9, 12, 15}

Mastication is one of the primary functions of stomatognathic system and may occur bilaterally, but the majority of individuals have preferred chewing side. In several researches no significant differences were found between the proportions of individuals who preferred to chew on the left or right side. Nevertheless, other researches have propounded that more adults prefer the right side.^{4, 5, 7, 12, 13, 16} The use

The Relationship between Handedness and Chewing Side

of the hands, feet, eyes, ears and the chewing that are functional activities with right and left symmetrical component, have a single preferred side. Preference for a particular side is termed laterality. The difference between right and left preference becomes apparent after birth. It has been asserted that the preferred chewing side is centrally designated and coupled with a preference for using the hand, eye, ear and foot of the same side.^{5, 7, 8, 13, 17, 18}

Hemispheric laterality is pertinent to the portion of the brain, in other saying the cerebral hemisphere, which identified laterality in the function of peripheral organs. Hemispheric laterality is mostly diagnosed by hand and other sidedness, including footedness, earedness and eyedness. These functional preferences are thought to be

related to cerebral dominance and have been ascertained to be significantly positive correlated with masticatory laterality in some researches^{19, 20}, however not in other researches.^{7, 13, 21} Other lateralities called postural preferences including hand-clasping, arm-folding and legcrossing preferences, are less influenced than handedness by cultural factors.²²

In the researches, that have been carried out so far, have not built consensus about the main factors designating preferred chewing side. Therefore, we aimed to investigate

whether right or left handedness are related to the chewing side preference using cracker as a test food in a population with fully intact dentition and normal chewing function by using a reliable method.

Table1.

T-Test					
Group Statistics					
	Handedness	N	Mean	Std. Deviation	Std. Error Mean
Chewing Side	Right Hand	20	3,9500	,94451	,21120
	Left Hand	16	3,8125	,65511	,16378

Table2.

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Chewing Side	Equal variances assumed	7,849	,008	,494	34	,624	,13750	,27818	-,42783	,70283
	Equal variances not assumed			,514	33,416	,610	,13750	,26726	-,40599	,68099

MATERIAL AND METHOD

36 patients were included to research, they have at least 28 teeth (except third molar) and class 1 occlusion, there is no tooth pain, periodontal problems and any muscle or temporomandibular joint disorders in the patients.

Edinburgh handedness inventory (EHI, Oldfield 1971) test was used for determining hand using side. From -100 to 100 score, which is laterality quotient (LQ), was calculated for each patient as described previously. Patients with LQ from 100 to 10 were defined as right-handedness, patients with LQ from -10 to -100 were defined as left-handedness. Patient with LQ 0, whose they have both handedness, were excepted.²³

For chewing side determining, the patients chewed little cracker four times and their chewing move was recorded with a video camera and it was determined by following the video. From -4 to 4 score was calculated for chewing side. Patient have score from -4 to -1 were left side chewing, score 0 both side chewing, score from 1 to 4 right side chewing.

Statistical Analysis

For statistical analysis was used SPSS independent sample t test. P value <0.05 was accepted considered statistically significant.

RESULT

In 36 patient, age avarage was 25. We didn't found any statistically significant difference between handedness and chewing side. (p=0.08) (Table-1 and Table-2)

DISCUSSION

The present study aimed to research the association between CSP and hemispheric laterality by looking at the relationship with the hand as a hemispheric laterality and determine the preferred chewing side. Our study results have verified that although bilateral chewing is prevalent among people, most individuals appear to have masticatory laterality while chewing, the reality is that there is a significant preference for chewing on the right side over the left side has also been reported in other studies carried out among different populations.^{13, 16, 19, 20, 24, 25} The distribution of the chewing side preference of the participants in the study was 78,3% to the right and 19,1% to the left, that is in a similar manner to other research results.^{5, 17, 21} It has been clearly determined that individual do not display the same mandibular movements when they are chewing. Some of them need additional chewing cycles, and also the amplitude and period of muscular contraction differ from among individuals. Patient's oral rehabilitation status has been affected by the chewing pattern. Some of researches has been reported that dental parameters are not related to the preferred chewing side,^{2, 5} however some of them concluded that dental and oral parameters are pertinent to CSP.^{3, 6-10, 26} In our study to eliminate all these factors, study groups were created from participants who have no oral or dental problems, missing teeth, temporomandibular disorders and have class I occlusion and normal chewing function.

According to the results of present study, most participants were right-handed 90% and that condition have resemblance to chewing side preference which confirms the results of some other studies.^{5, 17, 21} However, in our study it was found that chewing side preference in a dentate population is not related to handedness. In analogy to our results the correlation between masticatory laterality and handedness was not found to be significant in some studies,^{7, 13, 15} but not in other studies.^{19, 20} The incompatibility in the literature can be elucidated by differences in the research population, in the methods for detection of the preferred chewing side and in the type of test food utilized. Most studies have carried out with young adults with natural dentition,^{12,}

^{16, 27} others with children,²⁶ teenagers²⁸ or elderly participants.⁵ Due to the concept of preferred side of chewing has no universal description, some methods have showed the side where the food has been mostly chewed on,^{4, 5, 26} others specify the side where the jaw has moved to in the closing phase of mastication,^{9, 12, 16, 27, 29} and several studies have utilized a questionnaire to determine the preferred chewing side though the subjects' perceptions.^{11, 28}

According to our study finding, handedness has the highest right-side dominance might result from the influence of social and environmental factors. This distributional resemblance alleges that chewing side preference is centrally controlled and there was no statistically significant relationship between preferred chewing side and handedness.

REFERENCES

- [1] Serel Arslan S, Inal O, Demir N, Olmez MS, Karaduman AA. Chewing side preference is associated with hemispheric laterality in healthy adults. *Somatosens Mot Res*, 2017, 34: 92-95.
- [2] Jiang H, Liu H, Liu G, Jin Z, Wang L, Ma J, Li H. Analysis of brain activity involved in chewing-side preference during chewing: an fMRI study. *J Oral Rehabil*, 2015, 42: 27-33.
- [3] Mioche L, Hiiemae KM, Palmer JB. A postero-anterior videofluorographic study of the intra-oral management of food in man. *Arch Oral Biol*, 2002, 47: 267-280.
- [4] Kazazoglu E, Heath MR, Muller F. A simple test for determination of the preferred chewing side. *J Oral Rehabil*, 1994, 21: 723.
- [5] Nissan J, Gross MD, Shifman A, Tzadok L, Assif D. Chewing side preference as a type of hemispheric laterality. *J Oral Rehabil*, 2004, 31: 412-416.
- [6] Barcellos DC, Goncalves SE, da Silva MA, Batista GR, Pleffken PR, Pucci CR, Borges AB, Rocha Gomes Torres C. Prevalence of chewing side preference in the deciduous, mixed and permanent dentitions. *J Contemp Dent Pract*, 2011, 12: 339-342.

The Relationship between Handedness and Chewing Side

- [7] Pond LH, Barghi N, Barnwell GM. Occlusion and chewing side preference. *J Prosthet Dent*, 1986, 55: 498-500.
- [8] Gisel EG. Development of oral side preference during chewing and its relation to hand preference in normal 2- to 8-year-old children. *Am J Occup Ther*, 1988, 42: 378-383.
- [9] Wilding RJ, Adams LP, Lewin A. Absence of association between a preferred chewing side and its area of functional occlusal contact in the human dentition. *Arch Oral Biol*, 1992, 37: 423-428.
- [10] Tay DK. Physiognomy in the classification of individuals with a lateral preference in mastication. *J Orofac Pain*, 1994, 8: 61-72.
- [11] Reinhardt R, Tremel T, Wehrbein H, Reinhardt W. The unilateral chewing phenomenon, occlusion, and TMD. *Cranio*, 2006, 24: 166-170.
- [12] Varela JM, Castro NB, Biedma BM, Da Silva Dominguez JL, Quintanilla JS, Munoz FM, Penin US, Bahillo JG. A comparison of the methods used to determine chewing preference. *J Oral Rehabil*, 2003, 30: 990-994.
- [13] Martinez-Gomis J, Lujan-Climent M, Palau S, Bizar J, Salsench J, Peraire M. Relationship between chewing side preference and handedness and lateral asymmetry of peripheral factors. *Arch Oral Biol*, 2009, 54: 101-107.
- [14] Nayak UA, Sharma R, Kashyap N, Prajapati D, Kappadi D, Wadhwa S, Gandotra S, Yadav P. Association between Chewing Side Preference and Dental Caries among Deciduous, Mixed and Permanent Dentition. *J Clin Diagn Res*, 2016, 10: ZC05-ZC08.
- [15] Salioni MA, Pellizoni SE, Guimaraes AS, Juliano Y, Alonso LG. Functional unilateral posterior crossbite effects on mastication movements using axiography. *Angle Orthod*, 2005, 75: 362-367.
- [16] Paphangkorakit J, Thothongkam N, Supanont N. Chewing-side determination of three food textures. *J Oral Rehabil*, 2006, 33: 2-7.
- [17] Hoogmartens MJ, Caubergh MA. Chewing side preference in man correlated with handedness, footedness, eyedness and earedness. *Electromyogr Clin Neurophysiol*, 1987, 27: 293-300.
- [18] Wolff PH, Ferber R. The development of behavior in human infants, premature and newborn. *Annu Rev Neurosci*, 1979, 2: 291-307.
- [19] Nissan J, Berman O, Gross O, Haim B, Chaushu G. The influence of partial implant-supported restorations on chewing side preference. *J Oral Rehabil*, 2011, 38: 165-169.
- [20] Barcellos DC, da Silva MA, Batista GR, Pleffken PR, Pucci CR, Borges AB, Rocha Gomes Torres C, Goncalves SE. Absence or weak correlation between chewing side preference and lateralities in primary, mixed and permanent dentition. *Arch Oral Biol*, 2012, 57: 1086-1092.
- [21] Hoogmartens MJ, Caubergh MA. Chewing side preference during the first chewing cycle as a new type of lateral preference in man. *Electromyogr Clin Neurophysiol*, 1987, 27: 3-6.
- [22] Dittmar M. Functional and postural lateral preferences in humans: interrelations and life-span age differences. *Hum Biol*, 2002, 74: 569-585.
- [23] Oldfield RC. The assessment and analysis of handedness: the Edinburgh inventory. *Neuropsychologia*, 1971, 9: 97-113.
- [24] Diernberger S, Bernhardt O, Schwahn C, Kordass B. Self-reported chewing side preference and its associations with occlusal, temporomandibular and prosthodontic factors: results from the population-based Study of Health in Pomerania (SHIP-0). *J Oral Rehabil*, 2008, 35: 613-620.
- [25] Rovira-Lastra B, Flores-Orozco EI, Ayuso-Montero R, Peraire M, Martinez-Gomis J. Peripheral, functional and postural asymmetries related to the preferred chewing side in adults with natural dentition. *J Oral Rehabil*, 2016, 43: 279-285.
- [26] Mc Donnell ST, Hector MP, Hannigan A. Chewing side preferences in children. *J Oral Rehabil*, 2004, 31: 855-860.

The Relationship between Handedness and Chewing Side

- [27] Mizumori T, Tsubakimoto T, Iwasaki M, Nakamura T. Masticatory laterality--evaluation and influence of food texture. *J Oral Rehabil*, 2003, 30: 995-999.
- [28] Egermark-Eriksson I, Carlsson GE, Magnusson T. A long-term epidemiologic study of the relationship between occlusal factors and mandibular dysfunction in children and adolescents. *J Dent Res*, 1987, 66: 67-71.
- [29] Wilding RJ. The association between chewing efficiency and occlusal contact area in man. *Arch Oral Biol*, 1993, 38: 589-596.

Citation: Yerda ÖZKAN, Özlem SAHİN ATA, Recep ORBAK. *The Relationship between Handedness and Chewing Side. Archives of Dentistry and Oral Health. 2018; 1(2): 01-05.*

Copyright: © 2018 Yerda ÖZKAN, Özlem SAHİN ATA, Recep ORBAK. *This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.*