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CENTER OF OCCLUSION IN PATIENTS WITH DISTOOCCLUSION, ANGLE CLASS II DIVISION 1 AND ANGLE CLASS II DIVISION 2

ЦЕНТАР НА ОКЛУЗИЈА КАЈ ПАЦИЕНТИ СО ДИСТООКЛУЗИЈА ANGLE КЛАСА II 1 ОДДЕЛЕНИЕ И ANGLE КЛАСА II 2 ОДДЕЛЕНИЕ

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Abstract

Orthodontic malocclusions-distoocclusion, Angle Class II division 1 and Angle Class II division 2 are characterized by certain morphological, functional and aesthetic changes in the orofacial system that result in occlusal disharmony and morphologically and functionally unbalanced bite. We can conclude from the use the of the T-Scan III system in everyday orthodontic clinical practice, examinating the center of occlusion, that there is a positive correlation between morphological and functional occlusal parameters in 60 patients divided into two subgroups of the group.. We concluded that this patients have significant presence of occlusal interferences in the posterior area during mandibular excursions, as well as dislocation of center of occlusal force. **Key words:** orthodontics, occlusion, T-Scan III digital occlusal analyses, malocclusion, center of occlusion.

Апстракт

Ортодонтските малоклузии, втора класа според Angle или дистооклузија се карактеризираат со одредени морфолошки, функционални и естетски промени во орофацијалниот систем кои доведуваат до оклузална дисхармонија и морфолошки и функционално неурамнотежен загриз. Со помош на T-Scan III системот во секојдневната ортодонтска клиничка практика преку испитување на центарот на оклузија го утврдивме соодносот помеѓу морфолошките и функционалните оклузални карактеристики на мастикаторниот апарат и денталниот систем кај 60 испитаници со втора класа според Angle, поделени во две подгрупи. Заклучивме дека кај овие испитаници постои сигнификантно присуство на оклузални интерференции во постериорниот сегмент при мандибуларните движења и истите се карактеризираат со дислокација на центарот на оклузална сила. **Клучни зборови:** ортодонција, оклузија, T-Scan III дигитална оклузална анализа, малоклузија, центар на оклузија.

Introduction

Orthodontic malocclusions-distoocclusion, Angle Class II division 1 and Angle Class II division 2 are characterized by certain morphological, functional and aesthetic changes in the orofacial system that result in occlusal disharmony and morphologically and functionally unbalanced bite. The contacts of the antagonistic occlusal surfaces of the teeth are not in harmony, and there is the presence of interceptive or deflective contacts of the teeth during the eccentric excursions of the mandible[1-4]. These malocclusions are characterized by bilateral asymmetry of the occlusal contacts at maximal intercuspidation, non-simultaneity of the occluding contacts of the antagonistic teeth during eccentric mandibular movements, and dislocation of the center of occlusal force from the occlusal field to the mesial position. The time of occlusion and dislocation during occlusion and articulation is prolonged, and protrusive and balancing occlusal interferences are present[5-10]. We can conclude from the use of the T-Scan III system in everyday orthodontic clinical practice that there is a positive correlation between morphological and functional occlusal parameters between the two subgroups (division 1 and division 2) of the group- distoocclusion, Angle Class II. This supports our research hypotheses that overall occlusion and articulation differ between the examined subgroups of the group. The aim of this study is to examine the center of occlusion to determinate the relationship between morfological and functional occlusal characteristiscs of the masticatory system in orthodontic malocclusions – distoocclusion, Angle Class II division 1 and Angle Class II division 2.

Material and methods

In our study, 60 patients with orthodontic malocclusion-distoocclusion Angle Class II divided into two groups were analysed. The first group included 30 patients with distoocclusion Angle Class II division 1 (Figure 1), and the second group consisted of 30 patients with distoocclusion Angle Class II division 2 (Figure 2).

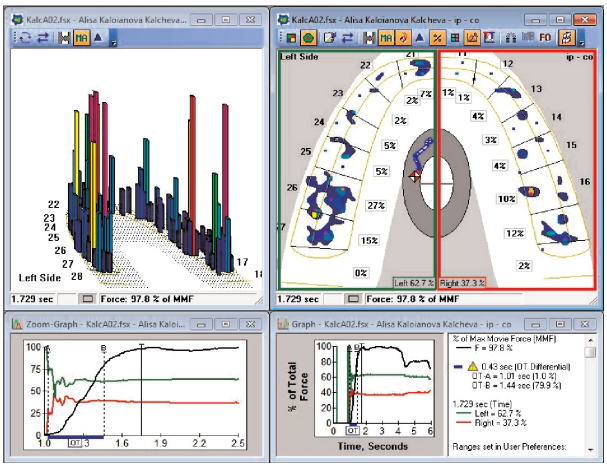
Figure 1. *Intraoral view of distoocclusion Angle Class II division 1.*

Figure 2. *Intraoral view of distoocclusion Angle Class II division 2.*

We conducted occlusal analysis on 60 patients using T-Scan III system (Tekscan Inc., Boston, MA, USA) (Figure 3) in the position of maximum intercuspidation, protrusion and left and right laterotrusion to determine the parameter of center of occlusal force. Center of occlusal force (COF) describes the occlusal balance and is the „equilibrium point“ of the occlusal forces. It is depicted as a red and white icon that represents the location of the

total force of the occlusal contacts. The total force is calculated by adding the medial and anteroposterior moments of force from the observed occlusal contacts. The trajectory of the center of force gives the path and history of occlusal contacts during mandibular closure or movement. The center of occlusal force is in relation to the double elliptical field, which represents the ideal location of the center of force and serves as a guide to normal occlusion[11-14]. (Figure 4).

Figure 3. *Overview of the T-Scan III system (Tekscan Inc., Boston, MA, USA).*



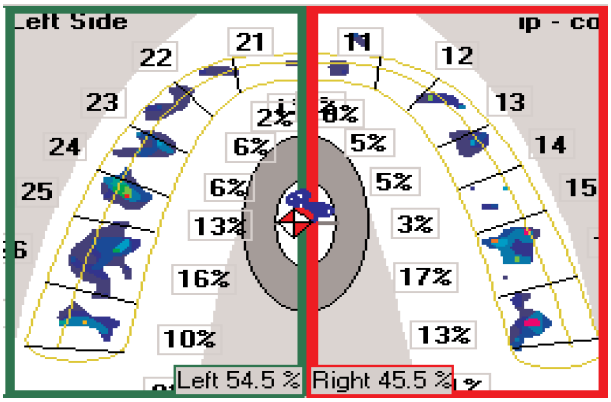


Figure 4. *Overview of the T-Scan III occlusogram and center of occlusal force.*

Results

Table 1. displays data on the center of occlusion in patients with distoocclusion Angle Class II division 1.

Out of a total of 30 patients, 1 (3.33%) had the center of occlusion in the white field of the double ellipse, 10 (33.33%) had the center of occlusion in the gray field of the double ellipse, and 19 (63.33%) had a dislocation of the center of occlusion dislocated outside the double ellipse.

Table 1. Center of occlusion in patients with distoocclusion Angle Class II division 1.

Center of occlusal force	N	Cumulative N	%	Cumulative %
White elipse	1	1	3,33	3,33
Grey elipse	10	11	33,33	36,67
Dislocation	19	30	63,33	100,00
Missing	0	30	0,00	100,00

Table 2. displays data on the center of occlusion in patients with distoocclusion Angle Class II division 2.

Out of a total of 30 patients, 2 (6.67%) had the center of occlusion in the white field of the double ellipse, 12 (40.00%) had the center of occlusion in the gray field of the double ellipse, and 16 (53.33%) patients had a dislocation of the center of occlusion outside the double ellipse.

Table 2. Center of occlusion in patients with distoocclusion Angle Class II division 2.

Center of occlusal force	N	Cumulative N	%	Cumulative %
White elipse	2	2	6,67	6,67
Grey elipse	12	14	40,00	46,67
Dislocation	16	30	53,33	100,00
Missing	0	30	0,00	100,00

Table 1. Center of occlusion in patients with distoocclusion Angle Class II division 1 and in distoocclusion Angle Class II division 2.

	Group	Center of occlusal force			Total
		White elipse	Grey elipse	Dislocation	
N	Distoocclusion Angle Class II division 1	1	10	19	30
%		3,33%	33,33%	63,33%	
N	Distoocclusion Angle Class II division 2	2	12	16	30
%		6,67%	40,00%	53,33%	
N	Total	3	22	35	60

For Pearson Chi-square = 28.40 and p <0.001 (p = 0.000) between the two groups of patients there is a significant difference in the shown frequency distribution referring to the center of occlusion (Table 3).

Discussion

We can see two elliptical fields in the center of the dental arch based on the relative position of the center of occlusal force of the occlusograms from the T-Scan III system. On the inside, a smaller white ellipse and on the outside, a larger gray ellipse. During the recording of the maximal intercuspidation in each patient, the position of the center of the occlusal forces is shown in the form of a red-white icon, which speaks about the balance of the occlusal forces during the occlusion. The inner ellipse represents the area where the center of occlusal force is located in 68% of the population with "normal" occlusion, while the outer ellipse represents the area where the center of occlusal force is located in 95% of the population with "normal" occlusion. Our findings are consistent with Kerstein's[15], that in 3 subjects in both subgroups the center of force is located in the white field of the double ellipse, in 22 subjects it is located in the gray field, while in 35 subjects a dislocation of the center of force outside the field of the double ellipse was registered. According to the analyzed results, there are protrusive and balanced occlusal interferences with increased dislocation time and right and left laterotrusion of the mandible in subjects with distoocclusion Angle Class II division 1. The center of occlusion in 1 (3.33%) patients is in the white field of the double ellipse, in 10 (33.33%) patients the center of occlusion is in the gray field of the double ellipse and 19 (63, 33%) patients have a dislocation of the occlusion center outside the double ellipse. The center of occlusal force of the occlusograms from the T-Scan III system in the subjects of the second subgroup follows an asymmetric distribution, with dislocation of the center of force at 53.33%.

Conclusion

Patients with distoocclusion Angle Class II division 1 and 2 have a bilateral asymmetric distribution of occlusal contacts on the right and left sides of the dental arch at the position of maximum intercuspidation. Occlusal force parameters are not symmetrical about the midsagittal axis of occlusal plane. There is a presence of protrusive and balanced occlusal interferences during mandibular excursions. The center of force for the antero-posterior occlusal contacts, as measured from the incisal axis of occlusal plane, was found to be more mesially from the double elliptic field and its dislocation was observed. Based on the results, we can conclude that there is positive correlation between morphological and functional occlusal parameters between subjects with malocclusion-distoocclusion Angle Class II division 1 and division 2[16-18]. This study's hypothesis about the difference between static occlusion and functional occlusion can be confirmed.

Reference

1. Angle EH. Classification of malocclusion. Dental Cosmos 1899, 41:248–264.
2. Зужелова М. „Ортодонција 1“. Скопје: Марив-С, 2014.

3. Ѓоргова Л., Кануркова Л., Џипунова Б., Тошевска-Спасова Н. „Ортодонтска морфолошка анализа и дијагностика“. Скопје, 2012.
4. Ramfjord SP, Ash MM. Occlusion, ed 3. Philadelphia: Saunders, 1983: 175-265.
5. Aubrey RB. Occlusal objectives in orthodontic treatment. Am J. Orthod. 1978 Aug; 74(2):162-75.
6. Ash M., Ramfjord S. Occlusion, W. B. Saunders Co; 4th edition, 1995.
7. Andrews LF: The six keys to normal occlusion. Am J. Orthod. 1972, 62:296-309.
8. Andrews LF, Andrews WA. The six elements of orofacial harmony. Andrews J. 2000; 1:13–22.
9. Thomson H. Occlusion. Wright, London, 1990, 33-43pp.
10. Clark JR, Evans RD., Functional Occlusion: I.A Review, J Orthod. 2001Mar; 28(1):76-81.
11. Şoaita, C., Popşor S. Computer analyses of functional parameters and dental occlusion. Scientific Bulletin of the Petru Maior University of Targu Mures; 2011, Vol. 8 Issue 2, p192 Dec 2011.
12. Baldini A. et al. Importanza clinica della valutazione computerizzata dell'occlusione. DENTAL CADMOS 2009 Aprile; 77(4).
13. Carcavilla, Marta Munoz; Zabalza, Rebeca Daemi; Cuenca, Anna: Importancia de la Valoracion Digitalizada de los Contactos Oclusales. Gaceta Dental Vol. 227 July 2011, pp. 172-187.
14. Pyakurel U 1, Long H2, Jian F2, Sun J3, Zhu Y1, Jha H4, Lai W5 Mechanism, accuracy and application of T-Scan System in dentistry-A review. Journal of Nepal Dental Association, Jan-Jun 2013.
15. Kerstein RB., Obtaining measurable bilateral simultaneous occlusal contacts with computer-analyzed and guided occlusal adjustments. Quintessence Int 2001:32:7-18.
16. Hassan R., Rahimak AK. Occlusion, malocclusion and method of measurements - an overview. Archives of Orofacial Sciences (2007) 2, 3-9.
17. Kazem S. Al-Nimria; Anwar B. Batainehb; Sawsan Abo-Farhac. Functional occlusal patterns and their relationship to static occlusion. Angle Orthodontist, Vol 80, No 1, 2010.
18. Al-Hiyasat AS, Abu-Alhaija ESJ. The relationship between static and dynamic occlusion in 14–17-year-old school children. J Oral Rehabil. 2004; 31:628–633.