

RESEARCH ARTICLE

FACIAL PARAMETERS AS SUPPLEMENTARY LANDMARKS FOR DETERMINATION OFVERTICAL DIMENSIONS OF OCCLUSION: DISTANCE ECTOKANTHION - CHEILION

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Abstract

Background: The successful recovery of the functions and the aesthetics appearance of the edentulous patients often is a kind of challenge. The use of correlation between facial parameters could facilitate the determination of the vertical occlusion dimensions. The purpouse of this research was to investigate the interrelation between vertical dimensions of occlusion and distance "external ocular angle (Ectokanthion) - labial commissure (Cheilion)" among persons with natural dentition.

Material and Methods: In the study were examined 120 persons from Bulgarian origin (59 male and 61 female), aged 20 to 25. The head of each and every participant was hold up into position so that the occlusal plane is parallel to the horisontal plane. The teeth were closed in central occlusion. Four reference points were marked: Ectokanthion, Cheilion, Subnasale and Gnathion. The researched distances were measured with the assistance of Vernier digital caliper. Statistical analysis of the obtained data was performed.

Results: Moderate correlation was found between the distance Ectokanthion-Cheilion and the vertical occlusion dimension. The dataanalysisshows that coefficients of correlation are: 0.5681 for male and 0.5481 for female.

Conclusions: It was found moderate correlation between the distance Ectokanthion-Cheilion and vertical dimensions of occlusion defined between point Subnasale and point Gnathion. The use of distance Ectokanthion-Cheilion as basic point of reference is not reliable, but it could be applied combined with other clinical methods or as part of mathematical models for determination of optimal vertical occlusion dimensions during prosthetic treatment of edentulous patients.

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Introduction:-

The rehabilitation of the masticatory system after total teeth loss is a complex task and one of the most important procedures is determination of the optimal vertical dimensions of occlusion. It is essential for adequate recovering of the functions and the aesthetical appearance of the patient, but often is a kind of challenge (Mc Cord and Grant, 2000; Monteith, 1984). The use of anthropometric proportions could significantly facilitate the recovery of the masticatory system with complete dentures (Edler et al., 2006). Numerous researches have been reported that are aimed at establishing the biometrical indicators of the craniofacial area, being used for orientation when it comes to defining the vertical dimensions of occlusion. Some researches are directed to evaluation of different craniometric methods (Delic et al., 2000). Other researches investigate the opportunities for application of cefalometric methods during determination of vertical dimension of occlusion (Brzoza, et al., 2005; Tavano et al., 2012). Some methods are based on correlations between facial parameters that are believed to remain constant as time passes by, even after complete teeth loss (Misch, 2000). Most of them include measurements between the soft tissue markers onto the skin, which correspond to bone references, since they are easily applicable, save clinical time and do not require expensive equipment (Chawla et al., 2000). The Bulgarian scientists have their contribution in the creation of the anthropometric methods based on anatomic orientation. According to Boyanov (1970) the vertical dimensions of occlusion could be defined with the use of correspondence between the distance from tuberculum labii superioris to point Gnathion and the length of the rima oris.

Akhma et al., (2017) find that the distance from eye's pupil to lips' contact point is equal to the one from pointSubnasale to point Gnathion in the status of central occlusion. The distance between the external eye angle and the mouth angle is other biological parameter wich applicability had been discused (Basnet et al., (2014); Alhaj et al., 2016). There have suggested different indexes for defining the vertical dimensions of occlusion, based on the established proportions between facial parameters (Hayakawa, 1999; Kusdhany et al., 2016). Nevertheless, the general validity of correlations between the facial measurements and the vertical dimensions of occlusion are put into doubt because of the presence of gender or ethnical dimorphism in some researched parameters (Delic et al., 2003). Statistically significant differences in view of sex were established in the research of most biometrical indicators and usually craniofacial measurements in men show higher values than the ones of women (Evereklioglu et al., 2002; Nagpal et al., 2014). Studies of individuals with different ethnic origin show divergence in the length of the lower one-third of face (Farkas et al., 2005; De Freitas et al., 2007).

More often than not we find contradictory opinions in the dental literature about the applicability of biometric indicators for defining the vertical dimensions of occlusion. The main concern is about the opportunities to achieve foreseeable and satisfactory results for the patient.

Material And Methods:-

The **purpouse** of this research was to investigate the interrelation between vertical dimensions of occlusion and distance "external ocular angle (Ectokanthion) - labial commissure (Cheilion)" among persons with natural dentition. One hundred and twenty persons (59 men and 61 women) from the Bulgarian origin, aged 20 to 25, were included in the study. The research was performed during 2017-2019 as part of major project designed for exploration of applicability of different facial parameters in prosthetic dental medicine.

Including criteria:

Individuals with complete permanent dentition and Angle class I jaw relations; without: prosthetic restorations, orthodontic treatment or temporomandibular disorders.

Excluding criteria:

Individuals who were not correspond to the including criteria.

All participants were invited to sign an informed consent.

The head of each and every participant was hold up into position so that the occlusal plane is parallel to the horisontal plane. The teeth were closed in central occlusion. This was performed with help of the bilateral manual technique of Ramfiord. The measurement points were marked with help of dermographic pencil, as follows: the external angle of the right eye - point Ectokanthion (Ec), the right labial commissure - point Cheilion (Ch), point Subnasale (Sn) in the base of the nose and point Gnathion (Gn) in the middle of the lower chin edge. The distances between the marked points were measured with the assistance of Vernier digital calliper as follows: from point Subnasale to point Gnathion (Sn-Gn); from the external angle of the right eye to the right labial commissure (Ec-Ch).

Statistical Methods:-

The following statistical methods were applied: descriptive analysis; correlative analysis; Student's t-Test. The statistical analysis was done with help of Microsoft Office Excel 2016.

Results:-

The established average value of the vertical dimensions of occlusion (Subnasale –Gnathion) is 61.42 ± 3.43 mm, correspondingly: 63.77 ± 2.55 mm for men and 59.15 ± 2.53 mm for women (Table1). The average value of the distance measured between the ocular angle and the right labial commissure is 72.14 ± 2.94 mm, correspondingly: 73.78 ± 2.46 mm for men and 70.55 ± 2.47 mm for women.

Participants	Men				Women				Total			
	N= 59				N= 61				N=120			
Parameters	mean	st.dev	max	min	mean	st.dev	max	min	mean	st.dev	max	min
Sn-Gn	63.77	2.55	70.97	59.26	59.1	2.53	65.	54.	61.42	3.43	70.97	54.15
Ec-Ch	73.78	2.46	77.53	67.94	70.5	2.47	73.	64.	72.14	2.94	77.53	64.73

Table 1:- Descriptive statistics of vertical dimension of occlusion, and facial measurements for all participants.

In view of all examined distances, we established statistically significant differences between the data that result from the measurements performed on men and women (p < 0.05). Taking this into consideration, we define it is purposeful to perform the correlative analysis individually for men and women, in order to ensure results' authenticity and the opportunity to implement them in practice when it comes to defining the vertical dimensions of occlusion.

The correlation analysis of data in view of all examined participants shows that there is clearly expressed correlation between the researched distance Ectokanthion- Cheilion and the vertical dimensions of occlusion (Sn-Gn) (Table 2).

Fable 2:-Correlative of	data analysis	about the r	researched	distances.
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Relation between distancesEc-Ch and Sn-Gn								
Participants	R	R Square	Adjusted R	Std. Error				
			Square					
Men	0.5681	0.3228	0.3109	2.1143				
N= 59								
Women	0.5481	0.3004	0.2885	2.1359				
N= 61								

The coefficient of correlation (Pearson) between the distance Ec-Ch and the vertical occlusion measurement is little bit higher for males (r = 0.568), than for females (r = 0.548), but this difference is without significance statistically (Fig. 1).



Fig. 1. Correlation between distance Ec-Ch and the vertical dimensions of occlusion (Sn-Gn)

Discussion:-

The established data about the average values of the vertical occlusion measurements -63.77 ± 2.55 mm for men and 59.15 ± 2.53 mm for women are similar to the ones established by Ladda et al. (2013), correspondingly -61.4 ± 4.2 mm for men and 56.7 ± 3.0 mm for women. Slightly higher average value of vertical dimensions of occlusionin men (69.25 ± 5.54 mm) was reported byMajeed et al. (2018), but the data obtained for women (57.41 ± 5.32) mm corresponds to the value established in our study. With help of cephalometric radiograph, within the Serbian population have established little bit higher values of the vertical dimensions of occlusion: 67.87 ± 5.67 mm for men and 61.51 ± 5.06 mm for women (Strajnic et al., 2008).

Within the Bulgarian population, we have established statistically significant differences in facial parameters, in view of individual's sex. Values obtained for men are higher than the ones for women which confirm the data found in similar studies implemented amidst the representatives of various populations (Basnet et al., 2014; Delic et al., 2003; Evereklioglu et al., 2002). Within limitation on this research, we can confirm the opinion expressed by numerous authors that the Ec-Ch distance is in correlation with the vertical occlusion dimensions. During the research held with representatives of the Yemen population, Alhaj et al. (2016) determined average distance from the external ocular angle to the mouth angle of 70.79 mm which is a little bit lower than the value obtained as - 72.14 mm. The differences in the data about the values of the researched facial parameters are most probably due to ethnical features.

Our data about average values of distance Ec-Ch - 73.78mmfor men and 70.55 mmfor women are in agreement with those reported by Majeed et al. (2018), who found 72.52 mm for men and 70.50 mm for women, correspondingly, when researching the population of the Saudi-Arabian ethnic group. According to Majeed et al. (2018), the difference between the average value of Ec-Ch and the average value of Sn-Gnis 3.27 mm for men and 13.09 mm for women. The correlation between data is significant only in the case of men hence they recommend the use of this biometric indicator only during prosthetic treatment of the masticatory system in men.

Within the framework of this research, in the Bulgarian population we established moderate but clearly expressed correlation between Ec-Ch and Sn-Gn for females - r = 0.548. On the grounds of that result, we consider this

parameter as applicable in its role of additional orientation for defining the vertical dimensions of occlusion in both men and women.

It was not found perfectly equivalent distance Ec-Ch and vertical occlusion dimensions in examined persons. The interval analysis of differences shows that the values of distance Ec-Ch can not be applied independently for definition of vertical occlusion dimensions. That confirms the opinion (Hayakawa, 1999) that the creation of complex formulas including patient's individual values of different facial parameters could provide more accurate determination of optimal vertical occlusion dimensions and more foreseeable results of the prosthetic treatment.

When it comes to using biometrical indicators as orientation when defining the vertical dimensions of occlusion, we should also take into account the fact that the data resulting about the average values of facial parameters are from participants of young age and with preserved natural dentition. The mouth angle in edentulous patients could change its normal position because of the lost support for soft tissues after extraction of the teeth and especially in the case of significant atrophy of alveolar ridges. In the elder patients the position of mouth angle is also impacted by many other factors such as decreased tonus of masticatory muscles and some neurological diseases that result in paresis or paralyses of n. Facialis, etc. We must take this into consideration, when we estimate the applicability of the distance Ec-Ch as additional landmark for determination of the vertical occlusion dimensions.

Because of the statistically significant differences in the data from the measurements performed of both sexes, we cannot define a single multiplying coefficient that is valid both for men and for women. With the assistance of mathematical analysis, were created formulas for defining of the vertical dimensions of occlusion both in men and women, while taking into consideration the gender-predefined differences in parameters (Hayakawa, 1999). The established correlation between researched parameters in representatives of Bulgarian populations confirms the expedience of inclusion of distance Ec-Ch in this kind of formulas.

Limitations of the study: only individual from Bulgarian population with Angles class I occlusion were examined.

Conclusions:-

It was found moderate correlation between the distance Ectokanthion-Cheilion and vertical dimensions of occlusion defined between point Subnasale and point Gnathion. The use of distance Ectokanthion-Cheilion as basic point of reference is not reliable, but it could be applied combined with other clinical methods or as part of mathematical models for determination of optimal vertical occlusion dimensions during prosthetic treatment of edentulous patients.

Conflict of interest: The author declares no conflicts of interest.

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