

COMPREHENSIVE ASSESSMENT OF CEPHALOMETRIC PARAMETERS IN PATIENTS WITH VARIOUS FORMS OF DISTAL OCCLUSION, DEPENDING ON THE TYPE OF HEIGHT/FACE

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ABSTRACT	KEYWORDS
The incidence of distal occlusion among anomalies of the maxillofacial region is increasing due to many endogenous and exogenous factors. According to various researchers, the distal ratio of the jaw bones may be due to the predominance of the growth of the upper, the lag in the growth of the lower, or due to problems of both jaws [5; pp. 67-84]. An approximately equal ratio of jaw bone growth types was determined in Zinchenko A.Yu. (2003) [4; pp. 57-88] with distal occlusion: in 36% of patients, neutral, 33% and 31% of the examined patients had horizontal and vertical types, respectively. E. J. Vares (1969) established that the jaws normally have a downward and anterior growth direction at an angle of about 50° to the base of the skull (NS). Depending on the growth trend, the anomaly may worsen or its clinical picture may self-regulate due to the growth of the maxillary system. Orthodontics specialists are changing their views on the treatment of distal occlusion, taking into account the component of jaw growth and its relationship with sagittal malocclusion [3; p. 38; 4; p.56; 6; p.102; 7; p.165; 10; p.102-104].	

Introduction

The purpose of the study. Comparatively evaluate the cephalometric parameters in patients with various forms of distal occlusion, depending on the type of height/face.

Research materials and methods. The material of this study was 90 people aged 10 to 29 years with distal occlusion who applied to the Orthodontics clinic in the period from 2019 to 2021. Patients by gender: 57 female patients, 33 male patients. The control group consisted of 13 people with satisfactory

facial characteristics, anthropometric, profilometric, and cephalometric parameters corresponding to the conditional norm.

The research methods were clinical examination, anthropometric, X-ray cephalometric, photometric methods and statistical analyses.

The clinical method of the study assessed the general condition of the hard and soft tissues of the oral cavity, paid attention to the shape of the face - full-face and profile, took into account the height of the lower third of the face and its proportionality.

The anthropometric study consisted in determining sagittal, transversal, vertical and longitudinal problems in the dentition according to Korchhaus - to determine the length of the anterior section, Ponu- to determine the width of the dental arch of the upper and lower jaws, Bolton-to study the proportionality of the mesiodistal sizes of the teeth of the upper and lower dental arches [1, 2, 8, 10]

The analysis of cephalometric images of teleroentgenograms was carried out using all relevant methods of cephalometric analysis: according to Schwartz, Tweed, McNamara. The bite height was determined using the MePe parameter proposed by us (perpendicular from the Menton point to the palatal plane, the type of height/face through the FMA angle, the proportionality of the jaw bones, their ratio to the cranial basis and in relation to each other, the slopes of the upper (U1-FH) and lower (L1MP) incisors, the character of the chin in relation to the vertical lines (Pog NPe) and so on. [8]

A statistical analysis of the data of cephalometric parameters was carried out. The direct and inverse correlations of the data are derived.

The results of the study. During the clinical examination of the comparison group (13 people), during visual examination from the frontal and lateral projections, the contours of the face in profile and full face were aesthetic, the oval of the face corresponded to the constitutional type, the right and left halves of the face were symmetrical, the upper, middle and lower parts of the face were proportional to each other, nasolabial folds were symmetrical and moderately pronounced, the chin fold is also moderately pronounced, the lips close without much tension, and the corners of the mouth are at the same height. The ratio of occlusion is physiological (known variants). Photos of the control group's faces (see Figure 1) and an overview of the tooth ratio (see Figure 2). [9]



Figure 1. Photo of the patient's face in the control group



Figure 2. Occlusal ratio in individuals of the comparison group.

According to the growth trend/type, the patients were divided by the F M A parameter into 3 main groups:

- I. Low angle-with a low angle (22 degrees or less)- 31 people
- II. Neutral angle-with a neutral angle (23-37 degrees)- 29 people.
- III. High angle-with a high angle (28 degrees or more) - 30 people.

A clinical examination of 31 patients from the first group of the study revealed signs of a “shortened” face: a low angle of the jaw, a shortened height of the lower part of the face, deepening of the nasolabial and mental folds, with protruding lips. (see Fig.3) Anthropometrically, signs of a class II anomaly in canines and molars, as a rule, narrowing of the upper dental arch with extrusion and vestibular inclination of the upper frontal teeth and the absence of incisor-tubercular contact with the injury of the mucous membrane of the anterior palate by the cutting edges of the lower frontal teeth.



Figure 3. Appearance of a patient with distal occlusion and horizontal growth type (Full-face photo and profile)

Form1

Определение длины переднего участка зубных дуг по ширине резцов

UPPER INSISORS

12	11	21	22
8	11	11	8

LOWER INSISORS

Показатели длины зубной дуги у пациента	Пациента
Верхняя передняя длина (мм) =	11
Нижняя передняя длина (мм) =	10

Рассчитать

Выход

Figure 4. Entering the values of the mesio-distal width of the upper incisors into the cells of the computer program.

The length of the anterior segment of the dental arches of the upper and lower jaws was determined using a computer program proposed by us. The analysis demonstrated the presence of a difference in the length of the anterior section of the upper and lower dental arches in the indicators of the norm and in the patient. Since the difference in distance is detected with a negative value, the program concludes that the dental arches are short. During orthodontic treatment, lengthening or shortening of the dental arches is recommended. (see Figs.4 and 5) [9].

Определение длины переднего участка зубных дуг по ширине резцов

UPPER INSISORS

12	11	21	22
8	11	11	8

LOWER INSISORS

Показатели длины зубной дуги у пациента	Пациента	Норма	Разница	Заключение
Верхняя передняя дуга (мм) =	11	21,8	-10,8	короткая
Нижняя передняя дуга (мм) =	10	19,8	-9,8	короткая

Показатели	Рекомендации
Длину верхней зубной дуги	удлинить
Длину нижней зубной дуги	удлинить

Очистить Рассчитать Выход

Figure 5. Display of anthropometric analysis data to determine the difference in the length of the anterior section of the dental arches by a computer program

The certificate DGU 2020 2405 dated 12/10/2020 on the official registration of the program for electronic computers from the Agency for Intellectual Property of the Republic of Uzbekistan "Determination of the length of the anterior section of dental arches by the width of incisors" (ShPVR.exe) (Rasulova Sh.R., Nasimov E.E., Aripova G.E., Dzhumaeva N.B., Kadirov R.H.) [9]. (see Fig.6) The time spent on determining the length of the anterior section of the dental arches using the program turned out to be 3.1 ± 0.03 minutes on average, the traditional of 8.6 ± 0.08 min



Figure 6. Certificate for the software product.

The cephalometric analysis was performed using the WebCeph computer program (see Fig. 7). According to the Tweed method, the FMA angle was on average $19.55 \pm 0.41^\circ$, which indicates a tendency to horizontal growth/face type and low angle, the jaw height parameter MePe averaged $54.71 \pm 0.41\text{mm}$, less than that of the control group ($61.77 \pm 1.75\text{mm}$), confirming the decrease in height. The front height of the face according to Jarabak Nation-Menton averaged $104.87 \pm 1.03\text{ m}$, positively correlating (0.48) with the proposed jaw height parameter MePe.

The chin index in relation to Ne (Pod to Pe) is on average $-7.65 \pm 1.20\text{ m}$. This value is higher than in the control group ($-2.46 \pm 0.81\text{ mm}$), indicating the posterior position of the chin. подбородка.

Table 1. The average values of cephalometric indicators in the 3 main groups and the control group

Indicators	Control group	Group 1	Group 2	Group 3
Age	23,23±0,79	16,52±0,87	15,59±0,58	17,23±0,70
FMA	23,00±0,9	19,55±0,41	24,69±0,27	31,53±0,43
Pog toNasion perpendicular	-2,46±0,81	-7,65±1,20	-11,28±1,14	-13,77±1,02
The inclination of the upper central incisor to FH	111,15±1,35	110,94±1,94	106,10±1,51	110,37±1,59
The inclination of the lower central incisor to MP	94,15±1,51	104,29±1,56	100,34±1,46	99,40±1,24
P1 – Me	61,77±1,75	54,71±0,41	58,24±0,66	64,03±0,93
N-Me	115.54±2.68	104.87±1.03	109.14±0.98	116.63±1.48

The inclination of the upper incisor to the Frankfurt horizontal U1-FH averaged $110.94 \pm 1.94^\circ$, in the control group – $111.15 \pm 1.35^\circ$. The first group has a protrusion of the lower incisors in relation to the mandibular plane (L1-MP). The angle was $104.28 \pm 1.56^\circ$, and the control group averaged $94.15 \pm 1.51^\circ$ (see table 1).[8]

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WEBCEPH

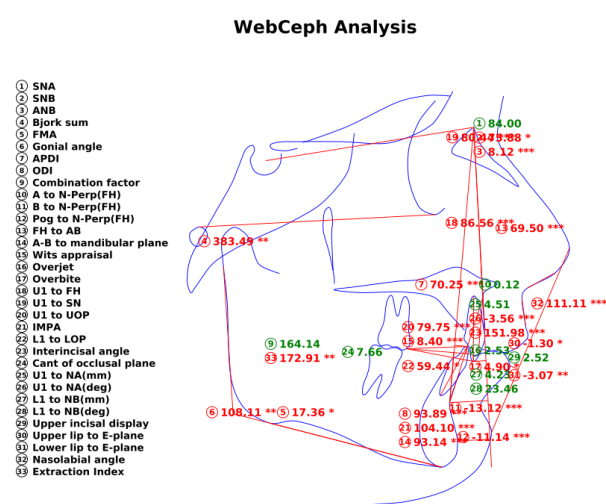


Figure 7. The results of the cephalometric analysis of the patient of group 1.

The second group (II) with a neutral angle consisted of 29 patients with distal dentition ratios with clinical, biometric and cephalometric parameters bordering on the norm. Facial features are within the normal range, aesthetic parameters are close to normal, the harmonious ratio of the lips (see Fig.8).

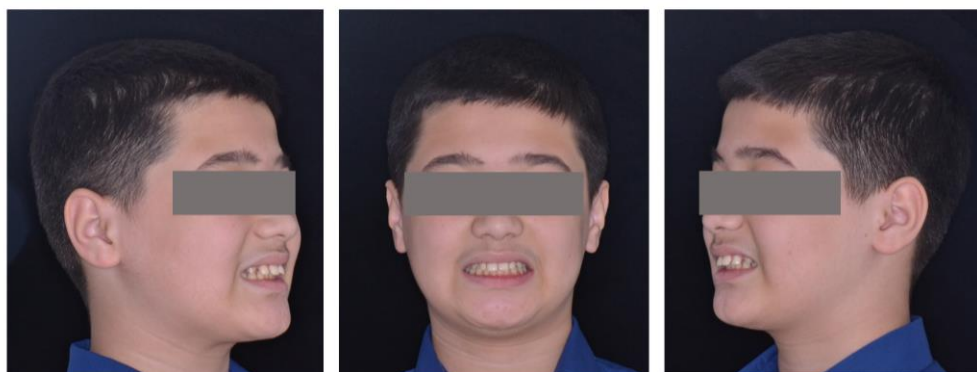


Figure 8. Appearance of a patient with distal occlusion and neutral growth type

The average angle of the jaw, the moderate height of the lower third of the face, and the vertical parameter data were closer to neutral were noted cephalometrically. (see Fig. 9) [8,9,10]

The cephalometric analysis was performed using the WebCeph computer program. The FMA angle is $24.69 \pm 0.27^\circ$, which indicates a neutral type of height/face and an average angle. In the control group, this angle is $23.00 \pm 0.87^\circ$. Both indicators correspond to the conditional norm of the parameters according to the Tweed method. The front height of the face according to Jarabak Nasion-Menton was 109.14 ± 0.98 mm, positively correlating (0.77) with the MePe jaw height parameter proposed by us, which is $58.2 \pm 0.66^\circ$. This parameter is lower than that of the control group ($61.77 \pm 1.75^\circ$), but within the limits of matching the neutral height of the lower third. Chin position in relation to Npe (Pog to NPe) It was $-11.28 \pm 1.14^\circ$, the value is higher than in the control group ($-2.46 \pm 0.81^\circ$), indicating the posterior position of the chin. The inclination of the upper incisor to the Frankfurt horizontal U1-FH $106.10 \pm 1.51^\circ$. In the control group – $111.15 \pm 1.35^\circ$, corresponding to a slight neutral inclination of the upper incisors. There is a compensatory protrusion slope of the lower incisors, which amounted to $100.34 \pm 1.46^\circ$ with respect to the mandibular plane (L1-MP). In the control group, this indicator averaged $94.15 \pm 1.51^\circ$. (see table 1)

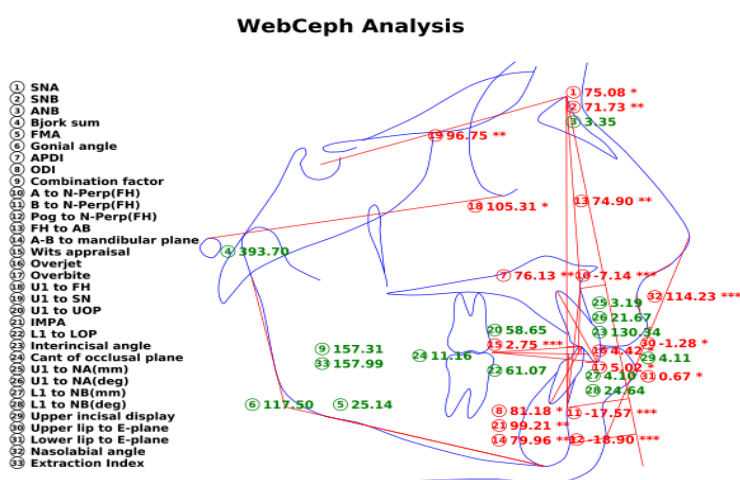


Figure 9. The results of the cephalometric analysis of the patient of group 2.

The third group (III) with a high angle included 30 patients with clinical, profilometric and photometric data of signs of a “long” face: an increase in the height of the lower part of the face, tension of facial muscles, gaping of the oral cavity with exposure of the upper frontal teeth, non-closure of the lips, most patients had a “thimble” symptom. (see Fig. 10) Anthropometrically, there were signs of a class II anomaly in canines and molars, narrowing of the upper and lower dentition and their shortening/elongation.



Figure 10. Appearance of a patient with distal occlusion and vertical growth type (full-face and profile photos, (right and left))

Cephalometrically, a high angle was observed according to the FMA parameter, which averaged $31.53 \pm 0.43^\circ$, indicating a high type of height/face, in the control group this angle was $23.00 \pm 0.87^\circ$. (see Fig.11). The front height of the face according to Jarabak Nasion-Menton averaged 116.63 ± 1.48 mm, positively correlating (0.84) with the MePe height parameter proposed by us, which averaged 64.03 ± 0.93 mm, which is higher than in the control group (61.77 ± 1.75 mm). The position of the chin relative to Npe (Pog to NPe) averaged -13.77 ± 1.02 mm, the distance is greater than that of the control group ($-2.46 \pm 0.81^\circ$), indicating the posterior position of the chin associated with the vertical type and clockwise rotation of the lower jaw. The inclination of the upper incisors to the Frankfurt horizontal U1-FH in this group of patients averaged $110.37 \pm 1.59^\circ$, which indicates the indicators of the control group $111.15 \pm 1.35^\circ$, but at the same time there was a compensatory protrusion inclination of the lower incisors with respect to the mandibular plane (L1-MP) $99.4 \pm 1.59^\circ$, and in the control group in the average is $94.15 \pm 1.51^\circ$ (see table 1).

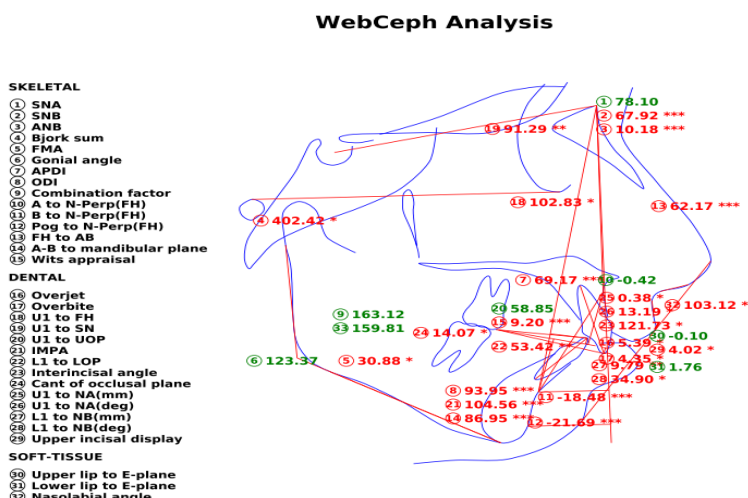


Figure 10. The results of the cephalometric analysis of the patient of group 3.

Conclusions

Based on clinical, profilometric, cephalometric and statistical indicators, it is advisable to carry out orthodontic treatment of patients with distal occlusion, depending on the type of face or height. Patients with a tendency to horizontal growth type should be treated with extrusion/restoration of the crown height of the chewing teeth, enlargement of the lower third of the face, with the elimination of blocks in the area of the frontal teeth and separation of deep incisive occlusion. During treatment, an increase in the FMA angle will contribute to an improvement in horizontal performance. Taking into account various clinical signs that require a differential orthodontic approach, the control of the vertical parameter improves treatment.

It is advisable to treat patients with a tendency to vertical growth by flattening the occlusal plane, shortening the height of the lower third of the face, and the intrusion of chewing teeth, contributing to the forward extension of the chin. It is necessary to pay attention to the dynamics of changes in the FMA angle, preventing an even greater increase in its value.

In patients with neutral cephalometric parameters and a neutral type of growth, it is necessary to maintain the height of the bite, adjust the slope of the occlusal plane to extend the lower jaw, while maintaining control over the vertical parameters.

Conclusion

From a scientific and practical point of view, the improvement of the treatment of distal occlusion should be based on a set of diagnostic parameters, taking into account clinical, profilometric, cephalometric signs based not only on the problems of the sagittal direction, but also taking into account the type of growth of the facial skeleton, vertical indicators affecting the positioning of the mandible and the definition of rational tactics for their orthodontic treatment.

References

1. Aripova, G., Rasulova, Sh., Nasimov, E., & Akbarov, K. (2019). THE EFFECTIVENESS OF ORTHODONTIC TREATMENT OF CHILDREN WITH DISTAL OCCLUSION OF THE DENTITION DURING THE PERIOD OF BITE CHANGE. *Stomatology*, 1(2(75)), 10-12. Retrieved from <https://inlibrary.uz/index.php/stomatologiya/article/view/1339>
2. Aripova, G., Rasulova, Sh., Nasimov, E., & Dzhumayeva, N. (2021). PREVALENCE OF VARIOUS FORMS OF DISTAL OCCLUSION IN ORTHODONTIC PATIENTS, TAKING INTO ACCOUNT THE TYPE OF JAW GROWTH. *Medicine and Innovation*, 1(4), 421-425.
3. Galich LV, Kuroedova V, Lakhtin Y, Galich LB, Moskalenko P. DEPENDENCE OF MORPHOMETRIC PARAMETERS OF THE DENTAL OCCLUSION ON THE TYPE OF THE LOWER JAW GROWTH IN CHILDREN WITH CLASS II DENTOFACIAL ANOMALIES WHO LIVE IN THE NORTHERN UKRAINE. *Georgian Med News*. 2017 Mar;(264):35-39. PMID: 28480846.
4. Zinchenko, A.Yu. (2003). ASSESSMENT OF THE INFLUENCE OF THE HARMONIOUS DEVELOPMENT AND TYPE OF GROWTH OF THE DENTAL SYSTEM ON THE PLANNING OF ORTHODONTIC TREATMENT OF CHILDREN WITH DISTAL OCCLUSION OF THE DENTITION. Abstract, Moscow, 2003
5. Nasimov, E.E. (2019). IMPROVING THE METHODS OF DIAGNOSIS AND TREATMENT OF DISTAL OCCLUSION. Abstract, Tashkent, 2018.

6. Papazyan A.T. THE INFLUENCE OF THE GROWTH PATTERN OF THE MAXILLOFACIAL SYSTEM ON THE ORTHODONTIC TREATMENT PLAN. Bulletin of the RUDN, Medicine series, 2008, No.8
7. Perović T, Blažej Z, Jovanović I. COMPARATIVE EVALUATION OF VARIOUS NASAL SHAPES AND ANGLES IN DIFFERENT VERTICAL GROWTH PATTERNS - A Cephalometric Study. Anthropol Anz. 2023 Mar 16;80(2):159-170. doi: 10.1127/anthranz/2023/1548. PMID: 36752663. 4-let
8. Rasulova, S. OPTIMIZATION OF THE CALCULATION OF TELERENTGENOGRAMS IN THE DIAGNOSIS OF DISTAL OCCLUSION, TAKING INTO ACCOUNT THE COMPONENT OF VERTICAL JAW GROWTH. № 4 (85) 2021, 66-70.
9. Rasulova, Sh, Aripova G.E., Nasimov E.E. THE POSSIBILITY OF INFLUENCING THE DEGREE OF DIVERGENCE OF JAW BONES DEPENDING ON VARIOUS FORMS OF DISTAL OCCLUSION IN GROWING ORTHODONTIC PATIENTS, TAKING INTO ACCOUNT THE TYPE OF GROWTH. JOURNAL OF DENTISTRY AND CRANIOFACIAL RESEARCH. Special Issue 2022. 154-156
10. Rasulova, Sh., Aripova, G., Nasimov, Z., & Babajanov, J. (2021). JUSTIFICATION FOR TAKING INTO ACCOUNT THE VERTICAL GROWTH COMPONENT IN THE DIAGNOSIS AND TREATMENT PLANNING IN PATIENTS WITH DISTAL OCCLUSION. Medicine and innovation, 1(1), 101-104.
11. Rasulova, Sh., Aripova, G., Nasimov, E., Murtazaev, S., Dzhumaeva, N., & Kadirov, R. (2021). CONSTRUCTION OF A MATHEMATICAL MODEL TAKING INTO ACCOUNT THE DEPENDENCE OF THE LENGTH OF THE ANTERIOR SEGMENT OF THE DENTITION AND THE WIDTH OF THE UPPER INCISORS (ACCORDING TO KORHAUS). Stomatologiya, (2(83), 44-46.