http://dx.doi.org/10.35630/2199-885X/2021/11/1.26

OCCLUSAL PLANE ORIENTATION IN PATIENTS WITH DENTOFACIAL ANOMALIES BASED ON MORPHOMETRIC CRANIO-FACIAL MEASUREMENTS

Received 02 February 2021;
Received in revised form 22 February 2021;
Accepted 23 February 2021

***Vladimir Shkarin*[1], *Taisiya Kochkonyan*, *Ghamdan Al-Harazi*[2], *Dmitry Domenyuk*[3]✉, *Sergey Dmitrienko*[1], *Stanislav Domenyuk*[4]**

[1] *Volgograd State Medical University, Volgograd, Russia*
[2] *Sana'a University, Sana'a Yemen*
[3] *Stavropol State Medical University, Stavropol, Russia*
[4] *North Caucasus Federal University, Stavropol, Russia*

✉ *domenyukda@mail.ru*

ABSTRACT — Based on 79 lateral projection head teleroentgenograms obtained from relatively young patients (median age, 37.4±4.3), we have developed a method for the occlusal plane orientation in view of cranio-facial anatomical reference points. As stable anthropometric reference points, we employed the gnathic angle shaped by the spinal and mandibular planes, as well as the interalveolar angle, where the subspinal Downs point and the supramental point were employed as retention elements. When reconstructing the occlusal plane in patients with dentoalveolar anomalies, the construction of the bisector of the interalveolar angle was explained as a key reference point, which allows diagnosing occlusion anomalies in the vertical direction (symmetrical and asymmetric) not only in the lateral, yet also in the frontal segment of the dental arches. The method developed for constructing the occlusal plane does not depend on the position of the incisors and the second permanent molars, which can be used to identify the vertical deformation of the dental arches.

KEYWORDS — teleroentgenogram research methods, occlusal plane, Camper's plane, pathological occlusion, physiological occlusion, dental arch defects, cranio-facial complex.

INTRODUCTION

In order to carry out morphometric studies of the craniofacial structure, modern dentistry relies on precision methods of X-ray diagnostics as well as on computer analysis [1, 6, 9, 13, 18, 20, 23, 30, 34].

Dental references and horizontal planes of the skull are of value for orthopedic and orthodontic analysis of the upper jaw spatial location, which means it is their stability that ensures potential for a clear transfer of its true spatial position to the articulator [2, 8, 22, 32, 37, 44, 48, 58].

Treating patients with abnormal dentition is a complex issue associated with the need to restore the individual occlusal plane, which is an average plane determined by the incisors cutting edges as well as by the lateral teeth occlusal surfaces. There is every reason to expand this concept by defining it as a planar total image of the curvature formed by these surfaces [10, 14, 17, 28, 53, 59].

If restored the right way, the dentition shape (occlusal plane) will maintain not only the biomechanic features of the masticatory system, but also the facial aesthetics, the temporomandibular joint function, and that of the maxillofacial area muscles [4, 7, 12, 16, 24, 3 1, 35, 40, 43, 45, 49].

Deformed dentition, which is due to early removal of temporary teeth, disturbed teething, cause lower jaw functional displacements, as well as altered interalveolar height. The functional changes get fixed morphologically over time [3, 15, 19, 29, 39, 50, 55].

According to A. Jacobson (1985), the occlusal plane is a line connecting the lowest point of the maxillary central incisor cutting edge with the lowest point of the palatal tubercle of the left maxillary first molar. Korkhaus (1939) claims that the occlusal plane runs through the middle of the incisor overlap to the middle of the overlap of the second molars mesial buccal tubercles of the upper and the lower jaws. Ujumetskene I.I. (1970) noted that the line passing through the middle of the molars and fangs vertical overlap, located slightly below the Xi point, basically being the bisector of the face lower third height angle, makes the occlusal plane. R. Slavicek (2004) divides the occlusal plane to the front (from the cutting edge of the central incisor to the first premolar buccal tubercle) and the distal one, which connects the molars and premolars [5, 27, 51].

The study includes a comparison of occlusal planes built relative to the hinge-orbital, facial and dental axes; Camper's and Frankfort's horizontals; the skull base plane drawn both through the lower point of the Turkish saddle and through its middle; the lower incisors plane; as well as a plane built along the inter-jaw angle, dividing it in the 27/73 ratio [47]. In orthodontic practice, the occlusal plane position

is determined by the occlusal plane angle shaped by Frankfort horizontal and the line located tangentially to the lower premolars' tubercles and the recesses between the second lower molars buccal tubercles. Normally, the angle value is 8±4° [26, 42].

Improving the occlusion is aimed at restoring the individual anatomical dentition relationship within all the three planes in view of the central position of the lower jaw heads. This requires an integrated approach implying clinical examination, X-ray examination to identify the position of the mandible head and the occlusal plane inclination, cephalometric analysis, as well as an axiographical examination in order to explore the lower jaw articulation [21, 25, 33, 38, 46, 52, 54].

In case of occlusion issues, especially affecting the vertical direction, when there is a tooth-alveolar extension of the second molars to be observed, identifying the distal point of the occlusal plane falling within the normal range would be complicated. Besides, vertical or deep incisor disocclusion would make it difficult to determine the interincisal point, since this pathology can be caused by an anomaly either on one of the jaws or on both dental arches [11, 36, 41, 56, 57, 60].

Despite a significant number of published research items touching upon methods for constructing the occlusal plane in orthodontic and orthopedic patients employing various anatomical structures and cephalometric parameters as reference points, there are no methods available for constructing the occlusal plane for abnormal vertical occlusion and lengthier dental arch issues. This serves an explanation for carrying out our own X-ray morphological study.

Aim of study:

to develop of a method for identifying the occlusal plane orientation via cranio-facial morphometric parameters in case of vertical occlusion issues as well as lengthier dental arches.

MATERIALS AND METHODS

The study involved 79 head lateral teleroentgenograms obtained from people of the first and second mature age (median age, 37.4±4.3), who came to a dental clinic with various dental complains. In compliance with the Ethics Committee requirements, informed consent was obtained for the X-ray examination from all the patients. The study employed points and lines that are conventionally used in clinical dentistry, in orthodontics in particular.

Subject to the study objectives, the gnathic part of the craniofacial area was separated by a spinal plane connecting the anterior nasal spine (the SNA point) with the SNP point located on the posterior nasal spine. This plane is the upper jaw base plane. The other line was the mandibular plane (MP) passing along the lower convex points of the lower jaw body. This is the lower jaw base plane. These planes intersected at the C point shaping the so-called gnathic angle, which was used in our further study to draw radial lines to the points of the jaw apical bases, in particular to the Downs subspinal point of the (A) and the supramental B point, thus shaping the interalveolar angle.

Camper's horizontal (CH) connected the anterior nasal spine (SNA) point to the point of the external auditory canal base (lower edge).

The occlusal plane was drawn following the standard procedure by connecting the incisal point (the middle of the medial incisors overlap) with the point located at the top of the vestibular distal odontomer of the second upper molar. Besides, we suggested drawing the said plane from the C point as the bisector of the interalveolar ACB angle (Fig. 1).

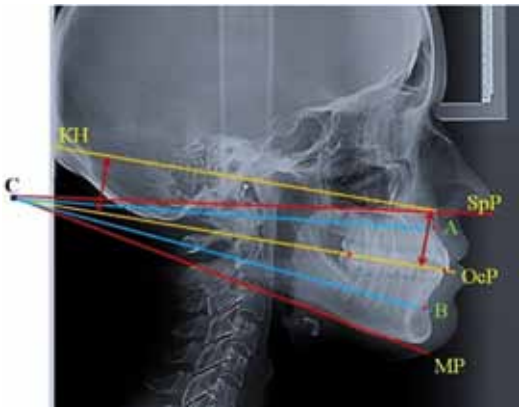

Fig. 1. *Specific features of the facial gnathic horizontal lines location in case of permanent teeth physiological occlusion*

The method proposed for constructing the occlusal plane allowed detecting vertical occlusion issues (symmetric and asymmetric) both in the lateral and anterior segment of the dental arches.

To identify the parallelism of the occlusal and Camper's horizontals, vertical measurements were taken between the lines in the anterior and posterior head parts. The conformity was assessed based on two meets / does not meet criteria, which required no extra statistical analysis methods.

RESULTS AND DISCUSSION

In people with physiological occlusion, the occlusal plane location corresponds to its construction according following the generally accepted method. In addition, the occlusal plane is parallel to Camper's horizontal, whereas the distance between the lines in

the anterior part of the head matches the size in the distal area for all types of the face gnathic part (Fig. 2).

People with vertical occlusion issues, however, had significantly different values, depending on the research methods employed. The construction of the occlusal plane, for instance, following the generally accepted method, namely, through the interincisal point and the distal vestibular tubercle of the second molar, differed from the proposed construction method (i.e. the gnathic angle bisector) (Fig. 3).

When dealing with dental arch issues combined with vertical deformations (Popov-Hodon phenomenon, dentoalveolar extension of antagonists), constructing the occlusal plane based on the method in question proved to offer an advantage, too (Fig. 4).

In case the traditional construction method was employed, too, the distal point of the occlusal plane did not coincide with the gnathic angle top. The distance between the Camper's horizontal and occlusal

Fig. 2. *A — the vertical growth of the jaws (mandibular angle, 128°); B — the neutral growth type of the jaws (mandibular angle, 119°); C — the horizontal type of growth (mandibular angle, 113°)*

Fig. 3. *Specific features of the facial gnathic horizontal lines location according to the generally accepted research methods (a) and following the proposed method (b) for abnormal vertical occlusion in the chewing teeth area*

In case of employing the traditional construction method, the distal point of the occlusal plane failed to coincide with the gnathic angle top (C point), while the distance between Camper's horizontal lines and the occlusion line in the anterior area did not match the distance in the distal part (in the figure, the scale of the mismatch indicated with a yellow arrow). The construction of the occlusal plane following the proposed method, fell within the physiological occlusion values and revealed the malocclusion in the vertical direction, which allows claiming this method can be employed to construct the occlusal plane in case of abnormal occlusal ratio.

line in the anterior part did not correspond to the distal part distance (yellow arrow).

The construction of the occlusal plane following the method we proposed matched the physiological occlusion parameters and showed the vertical occlusion anomaly, which allows this method to be recommended for constructing the occlusal plane for lengthier dental arch defects combined with vertical occlusion issues.

When systematized, the obtained data is a sufficiently convincing proof to support the idea that the proposed method can be used when dealing with various maxillofacial pathologies, as well as it can

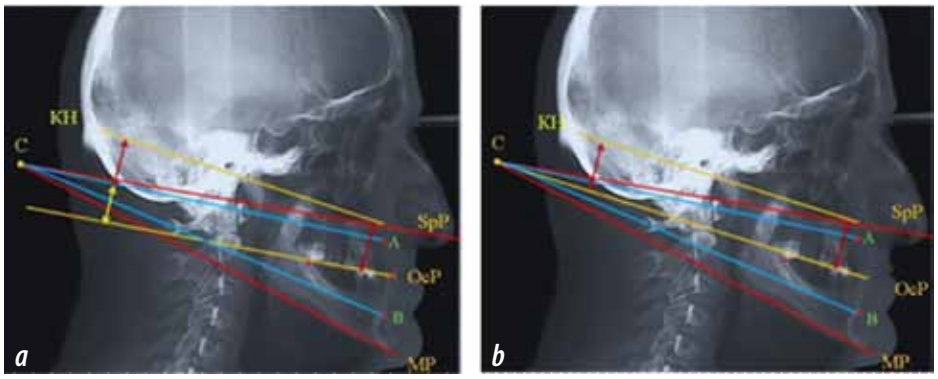

Fig. 4. Specific features of the facial gnathic horizontal lines location according to the generally accepted methods (a) and following the proposed method (b) for dental arch issues complicated by dentoalveolar extension of antagonists

prove useful when trying to develop the right tactics for comprehensive treatment.

CONCLUSIONS

1. Identifying the correct location of the occlusal plane is a task of prime importance in clinical dentistry when planning prosthetic and orthodontic treatment for patients with vertical occlusion issues, both in the lateral and in the anterior segments.
2. Improving the diagnostic reliability of various vertical occlusal anomalies, as well as forecasting acceptable functional and aesthetic outcomes for orthodontic and prosthetic treatment requires a comprehensive cephalo-, gnathic- and profilemetric examination.
3. The method developed for constructing the occlusal plane does not depend on the incisors' or the second permanent molars' position, while this fact can be used to identify the scale of the vertical deformation in the dental arches.
4. It is reasonable to employ the proposed method when determining the prosthetic plane in people with extended dental arch forms, as well as in case of complete absence of teeth.
5. Clinical and X-ray explanation for the orientation of the occlusal plane subject to the bisector of the gnathic angle allows programmed changing of the teeth position when recreating the occlusal plane through orthodontic and prosthetic treatment, i.e., its individualization. If recreated properly, the occlusal plane will allow constructing a balanced articulatory relationship and preventing functional disorders affecting the TMJ.

REFERENCES

1. **Avanisyan V., Al-Harazi G., Kondratyeva T., Harutyunyan Yu.** Morphology of facial skeleton in children with undifferentiated connective tissue dysplasia. Archiv EuroMedica. 2020. Vol. 10; 3: 130–141. https://dx.doi.org/10.35630/2199-885X/2020/10/3.32
2. **Bishara, S.E.** Textbook of Orthodontics. Mosby. – 2001. 592 p.
3. **Borodina V.V.** Biometry of permanent occlusion dental arches – comparison algorithm for real and design indicators. Archiv EuroMedica. 2018. Vol. 8. № 1. P. 25–26. DOI: 10.35630/2199-885X/2018/8/1/25
4. **Carlsson G. E., Magnusson T.** Management of Temporomandibular Disorders in the General Dental Practice Author(s)/Editor(s): ISBN: 0-86715-367-9 192 pp: 210 illus (67 in color) Quintessence Publishing. 2004.
5. **Carloson J.E.** Occlusal diagnosis. USA: MidWest Press, 2004. 217 p.
6. **Davydov B.N.** Anthropometric peculiarities of the maxillofacial region in children with congenital pathology in the period of the brew of the dairy teeth. Pediatric dentistry and prophylaxis. 2018; Vol. 17; 2 (65): 5–12. (In Russ.) DOI: 10.25636/PMP.3.2018.2.1.
7. **Davydov B.N. Kondratyeva T.A., Harutyunyan Yu.S.** Cephalometric features of connective tissue dysplasia manifestation in children and adolescents. Pediatric dentistry and dental profilaxis. 2020;20(3):174–183. (In Russ.) https://doi.org/10.33925/1683-3031-2020-20-3-174-183
8. **Davydov, B.N., Kondratyeva, T.A., Harutyunyan, Yu.S.** Improving diagnostics of periodontal diseases in children with connective tissue dysplasia based on X-ray morphometric and densitometric data. Parodontologiya.2020;25(4):266–275. (in Russ.) https://doi.org/10.33925/1683-3759-2020-25-4-266-275.
9. **Davydov B.N.** Morphological peculiarities of facial skelet structure and clinical and diagnostic approaches to the treatment of dental anomalies in children in the period of early change. Pediatric dentistry and prophylaxis. 2019; Vol. 19; 1 (69): 26–38. (In Russ.) DOI: 10.33925/1683-3031-2019-19-69-26-38.
10. **Dawson P.E.** Evaluation, diagnosis and treatment of occlusal problems, Ed. 2. St. Louis: Mosby, 1989. 180 p.
11. **Dickerson B.** Accurate transfer of the position of the upper jaw to the articulator along the sagittal and horizontal planes / B. Dickerson, N. Thomas // Dental Market. 2009. 5: 65–67.

12. **Dmitrienko S.V.** Algorithm for determining the size of artificial teeth by the morphometric parameters of the face in people with full adentia. Dentistry. 2018; 97(6): 57–60. DOI – 10.17116/stomat20189706157

13. **Dmitrienko S.V.** Analytical approach within cephalometric studies assessment in people with various somatotypes. Archiv EuroMedica. 2019. Vol. 9; 3: 103–111. https://doi.org/10.35630/2199-885X/2019/9/3.29

14. **Dmitrienko S.V.** Dynamics of periodontal fixing capacity through orthodontic treatment employing edgewise technique // Archiv EuroMedica. 2019. Vol. 9; 1: 151–152. https://doi.org/10.35630/2199-885X/2019/9/1/151

15. **Dmitrienko S.V.** Dentoalveolar specifics in children with cleft palate during primary occlusion period. Archiv EuroMedica, 2018; Vol. 8; 1: 33–34. DOI: 10.35630/2199-885X/2018/8/1/33

16. **Dmitrienko S.V.** Enhancement of research method for spatial location of temporomandibular elements and maxillary and mandibular medial incisors. Archiv EuroMedica. 2019. T. 9. № 1. P. 38–44. https://doi.org/10.35630/2199-885X/2019/9/1/38

17. **Dmitrienko T.D.** Connection between clinical and radiological torque of medial incisor at physiological occlusion. Archiv EuroMedica. 2019. Vol. 9. № 1. P. 29–37. https://doi.org/10.35630/2199-885X/2019/9/1/29

18. **Dmitrienko S.** Modern x-ray diagnostics potential in studying morphological features of the temporal bone mandibular fossa. Archiv EuroMedica. 2020. Vol. 10. № 1. P. 116–125. https://doi.org/10.35630/2199-885X/2020/10/36

19. **Domenyuk D.A.** Algorithm for forecasting the shape and size of dent arches front part in case of their deformations and anomalies. Archiv EuroMedica. 2017. Vol.7. № 2. P. 105–110.

20. **Domenyuk D. A.** Anatomical and topographical features of temporomandibular joints in various types of mandibular arches. Medical News of North Caucasus. 2019;14(2):363–367. DOI – http://dx.doi.org/10.14300/mnnc.2019.14089 (In Russ.)

21. **Domenyuk D.A.** Contemporary methodological approaches to diagnosing bone tissue disturbances in children with type 1 diabetes. Archiv EuroMedica, 2018; 8(2): 71–81. DOI:10.35630/2199-885x/2018/8/2/71

22. **Domenyuk D.A.** Major telerenthengogram indicators in people with various growth types of facial area. Archiv EuroMedica. 2018. Vol. 8. № 1. P. 19–24. DOI: 10.35630/2199-885X/2018/8/1/19

23. **Domenyuk D.** Structural arrangement of the temporomandibular joint in view of the constitutional anatomy. Archiv EuroMedica. 2020. Vol. 10. № 1. P. 126–136. https://doi.org/10.35630/2199-885X/2020/10/37

24. **Fischev S.B., Puzdyryova M.N.** Morphological features of dentofacial area in peoples with dental arch issues combined with occlusion anomalies. Archiv EuroMedica. 2019. Vol. 9; 1: 162–163. https://doi.org/10.35630/2199-885X/2019/9/1/162

25. **Fomin I.V.** Effect of jaw growth type on dentofacial angle in analyzing lateral teleradiographic images. Archiv EuroMedica. 2019. Vol. 9; 1: 136–137. https://doi.org/10.35630/2199-885X/2019/9/2/136

26. **Jankelson R.** A conversation with Dr. Robert Jankelson // Dental Practice Report. 2008;2: 18–23.

27. **Graber T. M.** Orthodontics. Principles and Practice; 4th ed. N. Y.: Elsevier, 2005. – 953 p.

28. **Gross, M. D.** Occlusion in Restorative Dentistry / M. D. Gross. Mathews. Churchill Livingstone, Edinburgh, London, Melbourne and New York, 1982. 169 p.

29. **Harutyunyan Yu.** Undifferentiated connective tissue dysplasia as a key factor in pathogenesis of maxillofacial disorders in children and adolescents. Archiv EuroMedica. 2020. Vol. 10; 2: 83–94. https://dx.doi.org/10.35630/2199-885X/2020/10/2.24

30. **Ivanyuta S.O.** Individual-typological variability of structures of the craniofacial area in people with various constitutions. Entomology and Applied Science Letters. 2020. Vol. 7; 1: 20–32.

31. **Ivanyuta O.P., Al-Harasi G., Kuleshov D.A.** Modification of the dental arch shape using graphic reproduction method and its clinical effectiveness in patients with occlusion anomalies // Archiv EuroMedica. 2020. Vol. 10; 4: 181–190. https://dx.doi.org/10.35630/2199-885X/2020/10/4.42

32. **Keim R.G.** 2002 JCO Study of orthodontic diagnosis and treatment procedures. Part 1. Results and trends. J Clin Orthod. 2002. Vol. 36; 553–568. DOI: 10.2319/032210-166.1

33. **Kondratyeva T.** Methodological approaches to dental arch morphology studying. Archiv EuroMedica. 2020. Vol. 10; 2: 95–100. https://dx.doi.org/10.35630/2199-885X/2020/10/2.25

34. **Korobkeev A. A.** Variability of odontometric indices in the aspect of sexual dimorphism. Medical News of North Caucasus. 2019;14(1.1):103–107. DOI – https://doi.org/10.14300/mnnc.2019.14062 (In Russ.)

35. **Korobkeev A.A.** Types of facial heart depth in physiological occlusion. Medical news of North Caucasus. 2018. – Vol. 13. – № 4. – P. 627–630. (In Russ., English abstract). DOI – https://doi.org/10.14300/mnnc.2018.13122.

36. **Korobkeev A.A.** Anatomical features of the interdependence of the basic parameters of the dental arches of the upper and lower jaws of man. Medical news of North Caucasus. 2018. – Vol. 13. – № 1-1. – P. 66–69. (In Russ., English abstract). DOI – https://doi.org/10.14300/mnnc.2018.13019

37. **Korobkeev A. A.** Clinical and computer-tomographic diagnostics of the individual position of medial cutters in people with physiological occlusion. Medical News of North Caucasus. 2020;15(1):97–102. DOI – https://doi.org/10.14300/mnnc.2020.15023 (In Russ.)

38. **Korobkeev A. A.** Morphological features of the maxillofacial region in patients with full secondary adentia and variations of the constitution. Medical News of North Caucasus. 2020;15(4):539–543. DOI – https://doi.org/10.14300/mnnc.2020.15127 (In Russ.)
39. **Lepilin A.V., Shkarin V.V., Al-Harazi G.** A biometric approach to diagnosis and management of morphological changes in the dental structure. Archiv EuroMedica. 2020. Vol. 10; 3: 118–126. https://dx.doi.org/10.35630/2199-885X/2020/10/3.30
40. **Lepilin A.V., Fomin I.V.** Diagnostic value of cephalometric parameters at graphic reproduction of tooth dental arches in primary teeth occlusion. Archiv EuroMedica, 2018. Vol. 8. № 1. P. 37–38. DOI: 10.35630/2199-885X/2018/8/1/37
41. **Lepilin A.V.** Dependence of stress strain of dental hard tissues and periodontal on horizontal deformation degree. Archiv EuroMedica. 2019. Vol. 9; 1: 173–174. https://doi.org/10.35630/2199-885X/2019/9/1/173
42. **McNamara J.A.** Orthodontic and Dentofacial Orthopedics. Needfarm Press. Inc., 1998. 555 p.
43. **Nanda R.** Biomechanics and Esthetic Strategies in Clinical Orthodontics. Saunders, 2005. 400p. DOI: 10.1016 / C2009-0-54720-4
44. **Nanda R. S.** Dentofacial growth in long-term retention and stability. Elsevier Inc. 2005. 383 p.
45. **Parmar A. B.** Smile design principles / A. B. Parmar, R. Doshi // Private Dentistry. 2007. № 10. P. 10–16. DOI: 10.4103 / 0972-0707.73387
46. **Porfiriadis M.P.** Mathematic simulation for upper dental arch in primary teeth occlusion. Archiv EuroMedica, 2018. Vol. 8. № 1. P. 36–37.
47. **Proffit W.R., Fields H.W.** Contemporary orthodontics. - St. Louis: C.V. Mosby, 2000. – 768 p.
48. **Rickets R.M., Bench R.M., Hilgers J.J., Shulhof R.** An overview of computerized cephalometrics. American Journal of Orthodontics, 1972, vol. 61, no. 1, pp. 1–27.
49. **Sadykov M.I., Nesterov A.M., Ertesyan A.R., Konnov V.V., Matrosov V.V.** Biomechanical evaluation of stress-strain condition of restorative ceramic pin structures and dental roots // Archiv EuroMedica. 2020. Vol. 10; 2: 115–120. http://dx.doi.org/10.35630/2199-885X/2020/10/2.29
50. **Sadykov M.I., Nesterov A.M., Ertesyan A.R., Konnov V.V., Sinev I.I.** Biomechanical assessment of the stress-strain status of splinting structures and teeth periodontium in case of chronic periodontitis // Archiv EuroMedica. 2020. Vol. 10; 4: 149–155. http://dx.doi.org/10.35630/2199-885X/2020/10/4.34
51. **Slavicek R.** The masticatory organ: functions and dysfunctions. Klosterneuburg, GAMMA Medizinischwissenschaftliche Fortbildung-AG, 2002. 544 p.
52. **Shkarin V.V., Ivanov S.Yu.** Morphological specifics of craniofacial complex in people with varioustypes of facial skeleton growth in case of transversal occlusion anomalie. Archiv EuroMedica. 2019. Vol. 9; 2: 5–16. https://doi.org/10.35630/2199-885X/2019/9/2/5
53. **Shkarin V.V., Grinin V.M., Khalfin R.A.** Specific features of transversal and vertical parameters in lower molars crowns at various dental types of arches. Archiv EuroMedica. 2019. Vol. 9; 2: 174–181. https://doi.org/10.35630/2199-885X/2019/9/2/174
54. **Shkarin V.V., Grinin V.M., Khalfin R.A.** Specific features of grinder teeth rotation at physiological occlusion of various gnathic dental arches. Archiv EuroMedica. 2019. Vol. 9; 2: 168–173. https://doi.org/10.35630/2199-885X/2019/9/2/168
55. **Shkarin V.V., Davydov B.N.** Non-removable arch orthodontic appliances for treating children with congenital maxillofacial pathologies – efficiency evolution. Archiv EuroMedica, 2018. Vol. 8. № 1. P. 97–98. https://doi.org/10.35630/2199-885X/2018/8/1/97
56. **Shkarin V.V.** Mathematical and graphics simulation for individual shape of maxillary dental arch. Archiv EuroMedica, 2017. Vol. 7; № 1: 60–65.
57. **Shkarin V.V., Porfiriadis M.P.** Setting reference points for key teeth location in case of abnormal dental arch shape. Archiv EuroMedica, 2017. Vol.7; № 2: 111–117.
58. **Turp J. S.** Dental occlusion: a critical refl ection on past, present and future concepts / J. S. Turp, C. S. Greene, J. R. Strub // J. Oral Rehabil. 2008. No 35. P. 446–453. DOI: 10.1111 / j.0305-182X.2007.01820.x
59. The Academy of Prosthodontics (1999) The Glossary of Prosthodontic Terms: 7th Edition. Journal of Prosthetic Dentistry, 81, 39–110. https://doi.org/10.1016/S0022-3913(99)70234-9
60. **Wolford L.M., Chemello P.D., Hillard F.H.** Occlusal plane alteration – Effects on functional and esthetics. Am. J. Orthod Dentofacial Ortop. 1994; 304–16. DOI: 10.1590/2177-6709.20.5.050-057.oar