CORRELATION OF DENTAL ARCH MAJOR LINEAR PARAMETERS AND ODONTOMETRIC INDICES GIVEN PHYSIOLOGICAL OCCLUSION OF PERMANENT TEETH IN VARIOUS FACE TYPES

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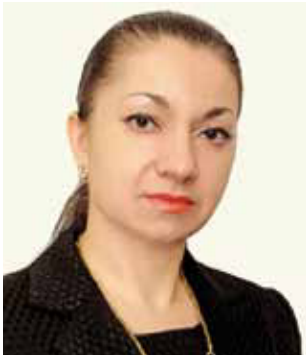

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ABSTRACT — Juvenile myoclonic epilepsy (JME) is one of the most comThe item offers a view on the outcomes of a study involving 192 persons aged 18–25 each possessing a full set of permanent teeth, with physiological occlusion and demonstrating various gnathic and dental face types and dental arches. The outcomes revealed a link between the size of the upper and lower dental arches. The ratio of the upper dental arch length taken against the similar parameters pertaining the lower jaw was 1.065±0.005 for all the types of dental arches. The index in question was employed to show the match between the teeth in the upper jaw and their lower counterparts. The ratio of the six front upper teeth to the crown width in the lower incisors and canine teeth was 1.3±0.02 and matched the findings obtained through Bolton's method. The ratio of half-sum of the 14 teeth to the frontal-distal diagonal was 1.065±0.005, with the upper and the lower dental arch alike. The ratio of the upper arch's diagonal dimension to its lower counterpart averaged 1.065±0.01 for all types of dental arches.

KEYWORDS — physiological occlusion; mesognathic face type; brachygnathic face type; dolichognathic face type; normodontia; macrodontia; microdontia.

The ratio of the upper and lower jaw dental arches has always been of interest to various professionals [2,4,9]. The methods employed to evaluate the match in the teeth size within this current study involved Tonn's method, Bolton's method, etc. [26]. There is a view offered on the teeth and dental arch sizes in people with physiological occlusion depending on the respective gnathic and dental types [5,6,11,14,17]. Relation has been detected between the dental arch size in the sagittal and the transversal planes, as well as the indices shown to identify the type of a dental arch [10,12].

There are advanced classifications proposed for dental arch shapes along with their major linear parameters [3,13,22]. Methods have been developed to evaluate the teeth size based on the major parameters of the head and the face [21,24,29,30]. A detailed analysis has been offered for specific features of the shape and the size of incomplete dental arches, which is due to lack of premolars [18]. Notion is proposed that disturbed ratio of the dental arches is associated with abnormal occlusion resulting in malfunction [1,20,25,27,28].

The impact has been identified that pathological occlusion has on the oral cavity microecology, which, in turn, facilitates impairment development in the periodontal tissue and the mucosa [23].

There is a lot of data available currently offering analysis of odontometric features, as well as dental arches linear parameters in people with dolichognathic, brachygnathic, and mesognathic dental arches at their normodontia, macrodontia, and microdontia [15,16]. Such studies are of extreme importance for clinical Orthodontics where the said parameters serve to help determine the braces to be prescribed and the size of the metal arch in cases employing the edgewise technique [7,8,19].

However, special literature offers no sufficient data regarding the interrelation between the major linear parameters of the dental arches and the odontometric indices in people with different face types.

AIM OF STUDY

To identify the relationship between the odontometric indices and the basic linear parameters for the upper and lower dental arches in cases of physiological occlusion with displaying various types of face.

MATERIALS AND METHODS

The study involved 192 persons aged 18–25 each having a full set of permanent teeth, physiological occlusion and various gnathic and dental types of the face and the dental arches.

To determine the dental type of the face, its diagonal size was evaluated from the t spot (located on the tragus) to the subnasal sn spot. The measurements of t-sn within the range of 123 mm to 130 mm were typical of the normodontial face. Smaller diagonal measurements were specific for those with microdontia of permanent teeth while an increase in the diagonal indicated macrodontia.

The gnathic type of face was determined based on its gnathic index calculated as a ratio of the diagonal and the transversal measurements. Given that, the transversal dimensions included the width of the face as taken between the tragus points t-t. The mesognathic type of face had a gnathic index varying between 83% and 93%. A lower value was indicative of the brachygnathic, and a higher value – of the dolichognathic face type (Fig. 1).

Similar types were detected for dental arches, whereas the type of the arch was calculated as the sum of the mesio-distal sizes of the 14 teeth (the wisdoms were not taken into account due to variability in their size). The dental arch length of 112–118 mm indicated normodontial dental arches, while any values beyond the said values were accepted as indicative of macro- and microdontia arches, respectively. The dental arch width was measured between the spots located on the canine teeth cusp near the crown's occlusion profile. With the second molars, the spots were located on the vestibular distal cusps. The arch diagonal was measured from the interincisal spot (on the vestibular side) to the second molars. The arch depth, too, was measured from the interincisal spot to the line joining the vestibular distal odontomeres of the second molars. The front-canine diagonal was measured from the interincisal spot to the canine cusp (Fig. 2a, 2b).

The interrelation was determined for the teeth size, the ratio of the transversal, sagittal and diagonal dimensions for the dental arches (both jaws) at all types of gnathic and dental types of face and dental arches.

The statistical processing was performed directly from the common data matrix of ECXEL 7.0 (Microsoft, USA) also involving certain features offered by the STATGRAPH 5.1 (Microsoft, USA) software, ARCADA (Dialog-MGU, Russia), and implied detecting the median values, its mean root square deviation, and the non-sampling error. Further on, following the patterns commonly employed for medical and biological studies (sample numbers; type of distribution; non-parametric criteria; reliability of the difference of 95%, etc.) the significance of the sampling difference was evaluated subject to the Student's criterion (t) and the respective significance index (p).

RESULTS AND DISCUSSION

The study showed that the major linear parameters and the odontometric indices for the upper dental arches correlated with similar parameters of the lower arches at all dental and gnathic types (Table 1).

The size of the teeth in people with macrodontial type of dental arches was reliably above that in people who revealed normodontia and all the more so in those who had microdontia, which appears something naturally expected. The length of the dental arch (the sum of the mesio-distal sizes of 14 teeth) was shorter in the lower jaw compared to the upper one. However, the mean ratio of the two values was 1.065±0.005 for all types of dental arches. The index in question revealed a match of the upper and the lower teeth, and was proven through Bolton's method.

The diagonal sizes of the dental arches typically correlated with the size of the teeth. The highest value for the frontal-molar diagonal was observed in people with macrodontial type of dental arches, while those with microdontia had the lowest value. The ratio of half-sum of the 14 teeth to the frontal-distal diagonal was 1.065±0.005 for both jaws.

The ratio of the diagonal dimension taken for the upper arch against its lower counterpart was an average of 1.065±0.01 for all types of dental arches.

The width of the upper dental arch between the second molars exceeded that if put against the lower

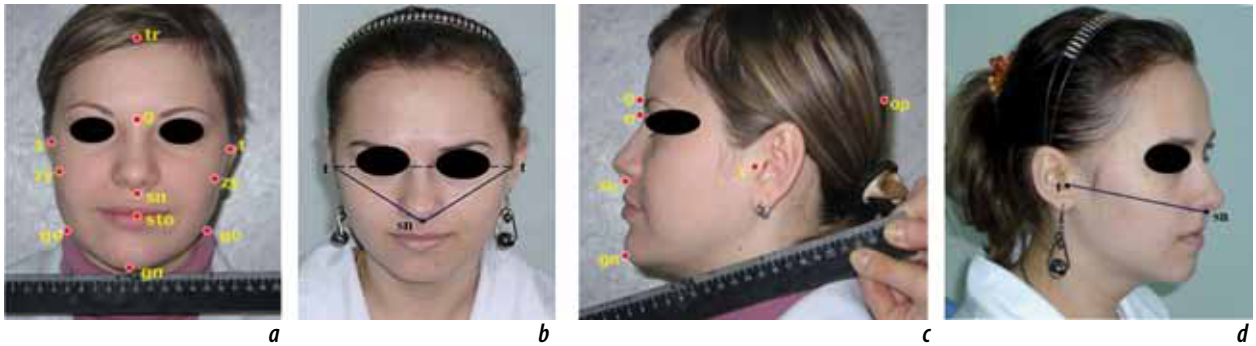

Fig. 1. *Cephalometric points used to define gnathic type of person: a, b — frontal plane; c, d — sagittal plane*

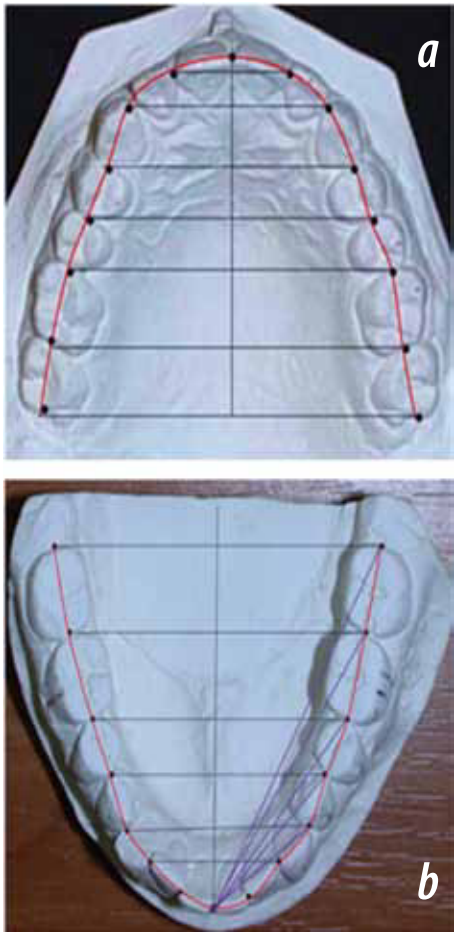

Fig. 2. *Dental cast model, upper (a) and lower (b) jaws with the reference lines to measure the dental arch parameters (photograph)*

arch width, regardless the type of the dental arch. The widest arches were found in those having brachygnathia, and in cases with brachygnathic macrodontia measured 71.31±2.03 mm on the upper jaw and 64.82±2.24 mm on the lower one. The lowest value for the dental arch width on both jaws was detected in people with dolichognathic types. Regardless of the dental arch type, the ratio of the upper arch width at the molars to the similar lower jaw parameters was 1.1±0.05.

The outcomes of the study obtained for the anterior part of the dental arches offer evidence to the fact that the major linear parameters and the odontometric indices on both jaws shared a correlation (Table 2).

The anterior part of the dental arch revealed patterns generally similar to those of the dental arches at large. For all types of dental arches, the anterior ratio (by Bolton's) was within the normal range (77.2±0.22). The ratio of sum for the 6 front teeth mesio-distal sizes to similar sizes for the lower teeth was 1.3 ± 0.02, which might be used as an extra criterion to describe the front teeth sizes.

The ratio of the dental arch width between the upper canines to the intercanine space in the lower dental arch was an average of 1.33±0.02. The size of the upper frontal-distal diagonal was above that of the lower dental arch at all types of the latter. During that, the ratio of the said parameters was 1.32±0.01.

CONCLUSION

The outcomes of the study reveal an interrelation between the size of the upper and the lower dental arches. The ratio of the upper dental arch length (the sum of the mesio-distal sizes of the 14 teeth) to the similar measurements of the lower jaw produced an average of 1.065±0.005 for all types of dental arches. The index in question points at a match in the size of the upper and the lower teeth. Meanwhile, the ratio of the 6 upper front teeth to the crown width in the lower incisors and canines 1.3±0.02, which matched the values obtained via Bolton's method. The ratio of half-sum of the 14 teeth to the frontal-distal diagonal was 1.065±0.005 both for the upper and for the lower jaw. The ratio of the diagonal sizes of the upper arch to a similar measurement of the lower jaw was an average of 1.065±0.01 for all types of arches.

The results of the study may be used for offering description to physiological occlusion, for detecting a match between the major measurements for the upper and lower dental arches, as well as for developing treatment forecast regarding dental arch shape and size when dealing with patients displaying abnormal occlusion.

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Table 1. *Major indices for dental arch parameters in people with physiological occlusion, (mm), (M±m; p ≤ 0.05)*

Dental arch	Major indices for dental arch parameters					
	Σ_{14} teeth on jaw		Molar width of arch		Arch diagonal	
	Upper	Lower	Upper	Lower	Upper	Lower
Meso-, Normo-	116.9 ± 2.87	108.7 ± 2.95	60.84 ± 1.14	55.16 ± 1.29	55.12 ± 1.29	51.34 ± 1.22
Meso-, Macro-	120.91 ±2.92	112.42 ±2.79	64.78 ±1.84	58.89 ±1.92	57.03 ±1.32	53.04 ±1.02
Meso-, Micro-	105.69 ±2.31	99.26 ±2.08	58.56 ±1.57	53.31 ±1.76	49.51 ±1.15	46.37 ±1.23
Brachy-, Normo-	115.5 ±2.87	108.4 ±2.95	67.34 ±2.15	61.19 ±2.12	54.23 ±2.04	50.78 ±1.33
Brachy-, Macro-	122.81 ±2.98	114.69 ±2.89	71.31 ±2.03	64.82 ±2.24	57.91 ±2.18	54.08 ±2.09
Brachy-, Micro-	107.32 ±1.85	101.62 ±1.92	61.74 ±1.97	56.13 ±1.43	50.63 ±1.21	47.46 ±1.11
Dolicho-Normo-	115.4 ±2.94	107.9 ±2.93	56.49 ±1.49	51.12 ±1.41	53.92 ±1.12	50.44 ±1.42
Dolicho-, Macro-	121.01 ±2.93	114.1 ±2.87	60.87 ±2.38	55.34 ±1.97	56.55 ±1.29	53.81 ±1.83
Dolicho-, Micro-	109.01 ±1.98	103.29 ±1.89	56.52 ±1.47	51.38 ±1.12	51.74 ±1.85	48.71 ±1.98

Table 2. *Major indices for anterior part of dental arches in people with physiological occlusion, (mm), (M±m; p ≤ 0.05)*

Dental arch	Major indices for dental arch parameters					
	Σ_6 of anterior teeth		Canine width of arch		Canine diagonal	
	Upper	Lower	Upper	Lower	Upper	Lower
Meso-, Normo-	46.46 ± 1.03	35.92 ± 1.11	38.53 ± 1.28	28.96 ± 0.87	20.83 ± 1.32	15.76 ± 1.22
Meso-, Macro-	48.1 ±1.19	37.16 ±1.24	37.78 ±1.21	28.15 ±1.17	21.47 ±0.44	16.44 ±0.51
Meso-, Micro-	42.92 ±1.17	33.22 ±1.21	33.93 ±1.26	25.19 ±1.19	18.62 ±0.59	14.19 ±0.69
Brachy-, Normo-	47.92 ±1.36	37.08 ±1.62	40.95 ±1.82	31.01 ±0.89	21.42 ±0.99	16.19 ±1.49
Brachy-, Macro-	49.81 ±1.43	38.38 ±1.39	38.36 ±1.36	28.66 ±0.93	22.12 ±0.76	16.87 ±1.12
Brachy-, Micro-	43.56 ±1.13	33.66 ±1.45	33.54 ±1.33	25.44 ±0.97	19.29 ±0.62	14.65 ±1.26
Dolicho-Normo-	48.54 ±1.54	37.58 ±1.55	35.71 ±1.77	27.02 ±0.93	20.95 ±0.85	15.98 ±1.24
Dolicho-, Macro-	57.32 ±1.53	40.44 ±1.59	37.31 ±1.55	28.52 ±0.98	20.88 ±0.94	15.93 ±1.28
Dolicho-, Micro-	45.92 ±1.37	35.54 ±1.42	34.58 ±1.24	25.92 ±1.09	20.03 ±0.49	15.31 ±1.07

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