CLASSIFICATION OF FACIAL TYPES IN VIEW OF GLATHOLOGY

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ABSTRACT — The outcomes of the study involving 187 persons with physiological occlusion, offered the basis for a classification involving 9 basic types depending on the gnathic index and the dental value. The gnathic facial index was calculated as ratio between the face diagonal (t – sn) to its width (t – t). The index within the range of 83–93% was typical of the mesognathic type of face. A lower index (below 83%) pointed at the brachygnathic type of face, while an increase in the index was characteristic of the dolichognathic type. The dental indicator of the face was estimated subject to the diagonal (t – sn). For the normodontia type, the diagonal value was 122 mm to 130 mm. Lower diagonal values (lower than 122 mm) was indicative of the micro-facial type of face, whereas an increase in the value (above 130 mm) – the macro-facial type of face. The data obtained can serve guide for determining the sizes of dental arches.

KEYWORDS — gnathic facial types, facial width, facial diagonal, gnathic facial index, dental type of face, normodontia, microdontia, macrodontia.

Human face has been the focus for research since ancient time, while the issue still remains relevant. One of the major directions for studying human face is clinical [9, 25, 27, 28]. There have been numerous methods proposed for studying and classifying certain facial types [26, 32].

In clinical dentistry, human face is assigned a special role when it comes to the choice of methods for orthodontic and prosthetic treatment [20, 21].

Methods for determining the proportion between the teeth and individual facial parameters have been proposed [4, 23].

To evaluate the facial profile, the methods developed by A.M. Schwarz are employed with 9 profiles identified – mesofrontal, transfrontal and cisfrontal, where the profile can be straight or oblique anterior/posterior [24].

At the same time, we found no data concerning the facial types from the stance of gnathology even though the contemporary literature offers numerous accounts focusing on the shape and dimensions of the dental arches in cases of physiological occlusion [8, 13,15, 16, 17, 19, 22, 29, 31].

There are basic odontometric and linear parameters presented for dental arches at various gnathic forms [1, 3, 5, 6, 10, 12, 14, 18, 30].

Clinical orthodontics is in extreme need of such studies, where the outcomes allow making conclusions regarding various prescriptions for brackets and indicate the dimensions of metal arches when treating patients employing the edgewise technique [2, 7, 11].

Special literature, however, contains not enough information about the facial types depending on the size of the dental arches and the gnathic forms of the dental arches.

Given that, the purpose of this study was to determine the facial types depending on the size of the teeth and the gnathic parameters of the dental arches.

MATERIALS AND METHODS

A biometric examination of the face and plaster models of the jaws was performed involving 187 people (age 18–30) with physiological occlusion of permanent teeth.

The type of face was determined through the dental score and the gnathic index.

The dental type of face was determined following the face diagonal indicator measured between the t (tragion) and the sn (subnazale) points. The t point was located on the upper edge of the ear tragus whereas the sn point was taken as the infranasal spot.

The diagonal measuring in the range of 123–130 mm was typical of the normodontia type of face. A higher value of the diagonal was typical of the macrodontia type, while the microdontia type featured a shorter diagonal (fig. 1).

The gnathic facial index was calculated as the percentage of the diagonal dimensions to the transversal ones. The diagonal dimension was accepted as the value of t–sn. The transversal dimensions were measured between the spots of t–t. The facial type was considered mesognathic in case the value was 83% to 93%. With a gnathic index less than 83%, the type of face was defined as brachygnathic, whereas an increase in the index bringing it above 93% was typical of dolichognathic type of face (fig. 2).

In addition, the patients had their dental arches determined. The major indicators characterizing the type of the upper dental arches were dental and gnathic.

The dental index was determined through the length of the dental arch, which was calculated as the sum of the crown widths (mesial-distal diameters) of 14 teeth (not taking into account the variable third permanent molars) (fig. 3).

The sum of the crown widths of the 14 upper teeth lying within the range of 112–118 mm revealed the normodontia dental arch type. An arch length below 112 mm revealed microdontia, while macrodontia was observed in case the value went above 118 mm. Thus, the major dental types of the upper dental arches were determined as normodontia, macrodontia and microdontia.
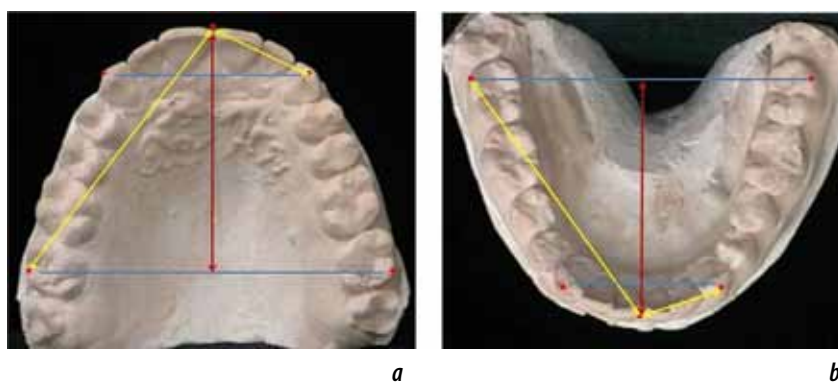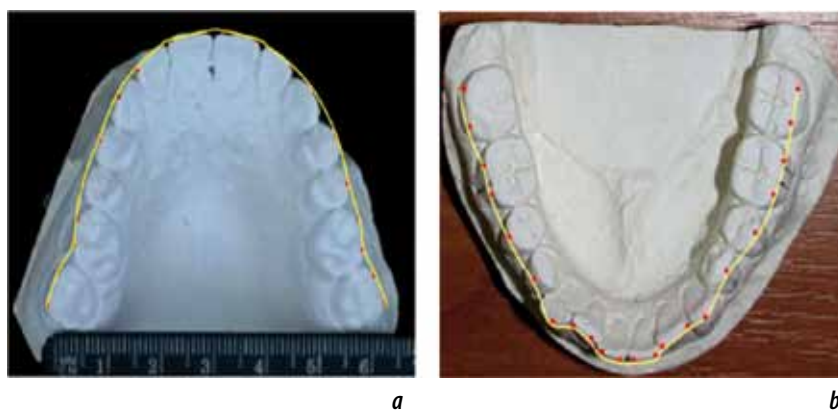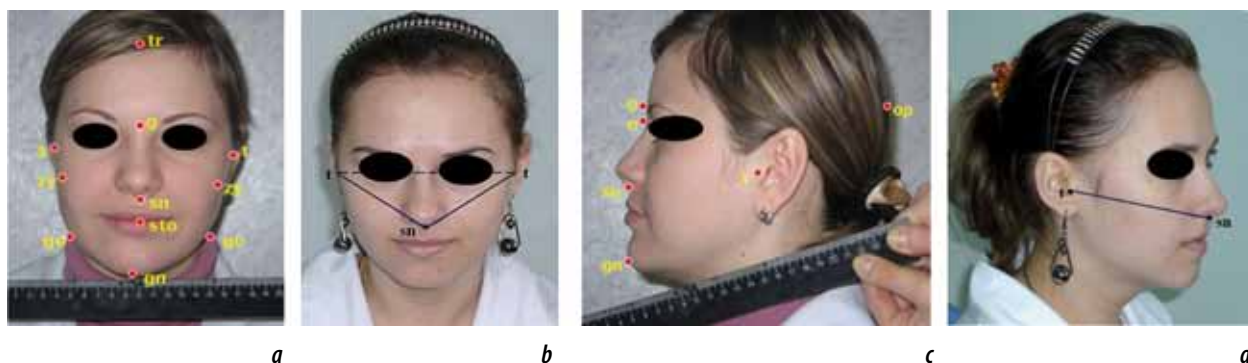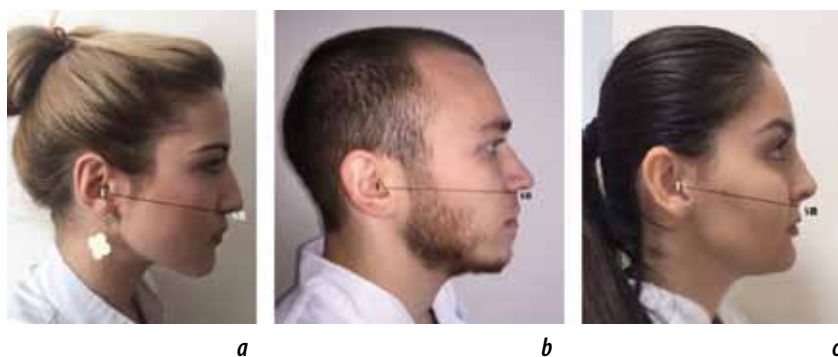
To determine the gnathic type of the dental arch, two main and relatively stable indicators were used — the size of the teeth and the width of the upper dental arch between the second molars.

The measuring points of the second molars were located on the vertices of the vestibular distal tubercles near the occlusal contour of the crowns (fig. 4).

The ratio of the crown widths half-sum of the 14 teeth to the width of the upper dental arch was indicative of the dental index of the arch, which determined its gnathic type. In case of index values within 0.9–0.97, the type of the dental arches was referred to as mesognathic. The index value below 0.9 was attributed to the brachygnathic type, while a value above 0.97 — to the dolichognathic type of dental arches.

A comparative analysis of the main facial parameters and the upper dental arches for all types of face was carried out.

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).

Fig. 1. Facial diagonals — normodontia type (a); macrodontia (b), and microdontia (c).

Fig. 2. Cephalometric points used to define gnathic type of person: a, b — frontal plane; c, d — sagittal plane

Fig. 3. Photographs of plaster models of the upper jaw (a) and lower jaw (b) with plotted contours of the tooth vestibular arc

Fig. 4. Width, depth and diagonal of the dental arches of the maxilla (a) and lower (b) jaw

RESULTS AND DISCUSSION

The outcome revealed that people with physiological occlusion of permanent teeth featured 9 main types of face. Based on the evaluation of the gnathic types, there were three major forms of face determined – mesognathic, brachygnathic and dolichognathic. For each gnathic type, 3 dental types were identified: normodontia, macrodontia and microdontia.

For each type of face, the main parameters of the face and the dental arches were evaluated. The study showed that people with physiological occlusion and mesognathic normodontia type of face, the face diagonal (t – sn) averaged 123.84±2.54 mm, while the width of the face between the points t–t was 140.48±2.89 mm. In this regard, the gnathic index of the face was 88.15±2.07. The results of the dental arches evaluation for this type of face showed that they, too, corresponded to the mesognathic normodontia type. The sum of the crown widths of the 14 teeth was 114.66±2.87 mm; the width of the dental arch between the second molars was 61.08±1.79 mm, and the arch index was 0.94±0.03.

In people with mesognathic macrodontia type of face, the face diagonal exceeded significantly that in people with normodontia and was 133.04±2.13 mm. At the same time, the width of the face between the points was 146.09±2.53 mm, while the gnathic facial index was 91.06±1.99. The results of the dental arches evaluation for this type of face showed that the length of the dental arch was 120.95±2.04 mm; the width of the dental arch between the second molars was 64.93±2.13 mm, and the arch index was 0.93±0.02.

For the mesognathic microdontia type of face, the diagonal dimensions were significantly smaller than those for the other dental types of the mesognathic face and were 117.01±1.93 mm. The width of the face was 134.83±2.38 mm, whereas the gnathic index was 86.78±2.45 and pointed at the mesognathic type of face. The dental arches parameters were as follows – the arch length was 109.36±1.87 mm; the arc width was 58.62±2.27 mm, and the dental index was 0.93±0.02.

The study of people with the brachygnathic normodontia type of face revealed that the diagonal of the face (t-sn) was 124.33±2.39 mm, and corresponded to a similar size observed in persons with the mesognathic type of face. During that, the transversal dimensions of the face were significantly above reaching 146.09±2.24 mm. In this regard, the gnathic index of the face was 91.06±2.43. The results of the dental arches evaluation in the type of face in question indicated that they also corresponded to the brachygnathic normodontia type. The length of the dental arch was 115.12±2.54 mm; the width of the dental arch between the second molars was equal to 67.82±1.88 mm, while and the arch index was 0.85±0.04.

Persons with the brachygnathic macrodontia type of face had their face diagonal significantly exceeding that of the normodontia cases, and the value was 133.11±2.54 mm. The width of the face between the points was 162.92±2.61 mm, and the face gnathic index was 81.7±2.04. The evaluation of the dental arches in this type of face showed that the sum of the crown widths for the 14 upper teeth was 122.83±1.95 mm; the width of the dental arch between the second molars was 71.28±2.24 mm, and the arch index was 0.86±0.03.

In the brachygnathic microdontia cases, the diagonal dimensions were significantly below those for the other dental types of the mesognathic face, being equal to 115.93±3.42 mm. The face width was 143.02±2.14 mm, while the gnathic index was 81.05±2.14 and revealed the brachygnathic type of face. The dental arches parameters were as follows – the arch length of 107.34±2.49 mm; the arch width – 61.75±1.92 mm, and the dental index of 0.87±0.02.

The outcomes of the study revealed that people with dolichognathic normodontia type of face had a face diagonal of 126.56±2.94 mm, with a width of the face between the points t–t equal to 131.82±2.67 mm. Given that, the gnathic index of the face was 96.0±2.17. The results of the dental arches evaluation for this type of face showed that they also corresponded to the dolichognathic normodontia type. The length of the upper dental arch was 116.11±2.44 mm; the width of the dental arch between the second molars was 57.82±1.93 mm, and the arch index was 1.0±0.02.

People with dolichognathic macrodontia type of face featured a face diagonal that exceeded significantly that typical of normodontia, and was 131.92±2.19 mm. The width of the face between the points was 136.91±2.26 mm, while the facial gnathic index was 96.35±1.92. The results of the evaluation of the dental arches typical of this type of face showed that the length of the dental arch was 121.03±2.55 mm; the width of the dental arch between the second molars was 60.85±2.29 mm, whereas the arch index was 0.99±0, 01.

In the dolichognathic microdontia type, the face diagonal dimensions were significantly below those of the other dental types of the mesognathic face, and were 116.64±2.78 mm. The width of the face was 122.08±2.49 mm, and the gnathic index was 95.54±2.13. The parameters of the dental arches were as follows – the arch length was 109.01±1.98 mm; the arch width was 54.02±2.59 mm, and the dental index was 1.0±0.02.

CONCLUSIONS

1. A classification of facial types proposed featuring 9 basic types depending on the size of the gnathic index and the dental index.

2. A rationale for the concept of the facial gnathic index offered, where the index in question is shown as the percentage ratio between the face diagonal (t–sn) and its width (t–t).

3. The gnathic index of 83–93% is indicative of the mesognathic type of face. A decrease in the index (below 83%) is an indication of the brachygnathic type of face, whereas an increase in the index (over 93%) is a feature typical of the dolichognathic type of face.

4. The facial dental index is estimated based on the diagonal dimensions (t–sn). For normodontia type of face, the diagonal value lies within the range of 122 mm to 130 mm. Smaller diagonal dimensions (less than 122 mm) reveal the microdontia type of face, while an increase (above 130 mm) means a macrodontia type.

5. The data obtained through the study may be employed to determine the size of the dental arches.

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