MISTAKES IN PONT (LINDER-HARTH) METHOD USED FOR DIAGNOSING ABNORMAL DENTAL ARCHES IN TRANSVERSAL PLANE

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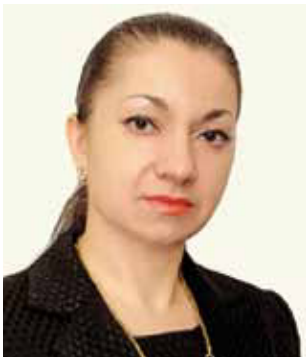

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ABSTRACT — This item is an analysis of the outcomes obtained through studying 362 cast models in patients (both females and males) revealing various gnathic and dental types of arches, which was done in order to identify the match of the estimates calculated via the Pont and Linder-Harth method, and the actual size of the dental arches between the premolars and the molars. The outcomes show that the transversal size of dental arches depend less on the teeth size and are determined by their gnathic type. For mesognathic dental arches, both methods are rather likely to be valid. When evaluating the parameter in question for brachygnathic arches, however, the methods based on Linder-Harth indices reveal significant faults. The index values based on Pont method are not recommended to be employed when working with people having dolichognathic dental arches with normo-, macro-, and microdontia.

KEYWORDS — physiological occlusion; mesognathic face type; brachygnlinear parameters of dental arches; double arch technique; edgewise technique metal arches; precasted metal arches

Identification of specific features pertaining to teeth, dental arches, dentoalveolar and dentofacial areas is, in general, of both applied and clinical value, proof to that being various ideas from many experts [2,4,6,8,13,20,24,26,29,30].

There have been numerous approaches proposed to identify the size of dental arches as well as to diagnose transversal anomalies, while such approaches are based on various links between linear parameters and odontometric values [5,7,9,11,14,15,21,25,27].

The most common methods for detecting dental arch width are Pont method and Linder-Harth method, which employ the ratio of the total width of the four maxillary incisor crowns to the premolar index (80 and 85) and the molar index (64 and 65). These methods are used by orthodontists to diagnose abnormal size of dental arches in transversal planes. A difference between the estimated and the actual values is indicative of impaired dental arch shape and size at the premolar and the molar areas. Disturbing is the fact that the same estimated values are calculated through different indices, while interpreting the outcomes will often prove rather complex. Besides, there is no mention of the types of dental arches where such methods are recommended to be employed in clinical practice [10,12,16,28]. Nine major types were selected to describe dental arches even in cases of physiological occlusion, whereas each of the types reveals certain features of dental and gnathic nature [1,3,17,18,19]. There is data available stating that the gender and race

features do not affect the major dimensions as much as dentofacial and odontometric parameters do [22,23].

Special literature does contain no sufficient data on transversal sizes of dental arches for different dental and gnathic types, and there is no indication of the cases where the said measuring methods could be employed.

AIM OF STUDY

To extend the role of transversal dimensions in diagnosing abnormal dental arch shapes in case of various dental and gnathic features.

MATERIALS AND METHODS

In order to identify a match between the estimated values calculated via Pont and Linder-Harth methods, and the real size of dental arches between premolars and molars, we studied 362 cast jaw models obtained from people of both genders revealing different gnathic and dental types of arches. Subject to the methods above-mentioned, the mesio-distal sizes of four maxillary incisor crowns were measured. Transversal dimensions were taken between the Pont points located on premolars and molars (Fig. 1).

The types of the dental arches were identified following the dental index of the arch, taken as ratio of half-sum crown width of 14 teeth to the width between the second molars (Fig. 2).

The dental arches falling within the dental index range of 0.94±0.03 were taken as mesognathic. An index below 0.9 indicated the brachygnathic type while a value above 0.97 was considered to belong to dolichognathic type of dental arch (Fig. 3).

Normodontial dental arches had a length varying in between 112 mm and 118 mm. Any value beyond the range was taken as associated with macrodontial or microdontial arches respectively. 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

After odontometric evaluation, all the patients had the transversal size of their dental arches estimated based on Pont and Linder-Harth methods in view of various dental and gnathic types of arches. Table 1 below offers a view on the outcomes.

It is obvious that the estimated transversal dimensions for macrodontia exceeded similar applicable values for other types of dental arches. Given that, the gnathic types of dental arches had no significant impact on the values. This is accounted for by the fact that in cases of macrodontia the sum of crown widths for the four upper incisors is larger compared with other types of arches.

The values calculated via Pont and Linder-Harth methods revealed significant differences in the area of premolars alone as the premolar index had major difference (80 and 85, respectively).

Measuring upper and lower dental arches demonstrated a mismatch between the estimated values and the actual ones (Table 2).

The study showed that the transversal dimensions of dental arches depend on the gnathic types of arches rather than on the teeth size.

Mention to be made that examination of mesognathic arches revealed no reliable difference between the estimated and the actual values. The data obtained serve evidence that Pont and Linder-Harth methods may be used to evaluate dental arch width in patients with mesognathic arches of all dental types (normo-, macro- and microdontia).

During that, the values obtained through studying brachygnathic arches with Linder-Harth method were reliably below the actual values. However, the estimated values used within Pont method revealed no significant difference when matched with the actual ones. This means that Linder-Harth method, if employed to analyze brachygnathic arches, is prone to significant errors.

In case of dolichognathic arches, the values were different from those obtained for brachygnathic arches. The estimated values obtained with Pont index were significantly above the actual values for normodontial as well as for microdontial and macrodontial dental arches. The estimated values taken within Linder-Harth method, however, demonstrated no difference from the actual values, which suggests that Linder-Harth method may be employed to detect the width of dolichognathic dental arches.

CONCLUSION

1. Transversal sizes of dental arches depend less on the teeth size and are determined by the gnathic type of the arch.

2. Both methods are likely to appear valid when working with mesognathic type of dental arches.

3. When evaluating the said parameter of brachygnathic arches, the methods based on identifying

Table 1. *Transversal size of dental arches evaluated following Pont and Linder-Harth method depending on the type of arches, (mm), (M±m; p ≤ 0.05)*

Dental arch	Estimated size of dental arch by			
	Pont method, between:		Linder Harth method, between	
	premolars	molars	premolars	molars
Mesognathic normodontia	38.75±0.54	48.44±1.07	36.47±0.97	47.69±1.09
Mesognathic macrodontia	42.62±0.69	53.03±1.14	39.98±0.82	52.23±1.13
Mesognathic microdontia	36.15±0.78	45.04±0.96	34.16±0.73	44.32±1.15
Brachygnathic normodontia	39.37±0.77	49.22±1.03	37.06±0.82	48.46±1.26
Brachygnathic macrodontia	42.79±0.75	53.51±1.26	40.28±0.79	52.68±1.18
Brachygnathic microdontia	37.51±0.74	46.87±1.37	35.29±0.84	46.15±1.37
Dolichognathic normodontia	40.03±0.59	50.03±1.26	37.67±0.87	49.26±1.39
Dolichognathic macrodontia	42.33±0.88	53.41±1.13	40.21±0.72	52.59±1.08
Dolichognathic microdontia	36.27±0.71	44.97±1.21	33.92±0.95	44.13±1.19

Table 2. *Transversal size of dental arches at molars and premolars depending on the type of arches, (mm), (M±m; p ≤ 0.05)*

Dental arch	Size of dental arch (mm) on jaw			
	Upper, between		Lower, between	
	premolars	molars	premolars	molars
Mesognathic normodontia	37.14±1.48	48.51±1.86	36.97±1.58	48.31±1.58
Mesognathic macrodontia	40.89±1.77	52.62±2.03	41.11±1.56	53.16±1.58
Mesognathic microdontia	35.31±1.73	45.69±1.44	35.79±1.64	45.61±1.72
Brachygnathic normodontia	40.87±1.34	52.77±1.74	40.81±1.28	52.69±1.86
Brachygnathic macrodontia	43.97±1.47	54.66±1.85	44.01±1.37	54.89±1.79
Brachygnathic microdontia	37.89±1.48	47.02±1.52	38.17±1.42	48.41±1.44
Dolichognathic normodontia	36.4±1.18	46.2±1.29	35.18±1.36	45.59±1.46
Dolichognathic macrodontia	36.21±1.53	46.59±1.34	36.01±1.75	46.89±1.37
Dolichognathic microdontia	34.29±1.17	42.11±1.57	34.81±1.66	42.05±1.28

dental arch width based on Linder-Harth index, are prone to produce a significant error.

4. The index values based on Pont method cannot be considered reliable when working with dolichognathic arches with normodontia, macrodontia and microdontia.

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