Original Paper

Correlations Between Craniofacial Morphology and Dento-Maxillary Anomalies in a Population of Children in The South West Region of Romania

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ABSTRACT: Purpose. Craniofacial morphology is usualy described by the head (cephalic index) and face form (prosopic index). The aim of this study was to establish the existence of correlations between the cranial and facial types and the dento-maxillary anomalies. Material and Methods. Data were collected from two groups of patients (a control group of 42 patients without dental anomalies and a test group of 76 patients with dento-maxillary anomalies) of both sexes and age range 11-16 years. Results. Both in the control and test groups, 50% of patients were classified in mesocephalic type and mesoprosopic type. Conclusions. Groups studied by us showed correlations between anomalies in the transverse plane and dolichocephalic type and correlations between anomalies in the sagittal plane and leptoprosopic type.

KEYWORDS: *prosopic index, cephalic index, dento-maxillary anomaly*

Introduction

Anthropometric parameters have always been of major interest to human biologists and anthropologists because they provide standards and make the distinction between two ethnic groups [1,2,3]. They are used in forensic medicine, plastic surgery, orofacial surgery, paediatrics, dentistry, and for diagnostic comparisons between patients and normal populations.

Craniofacial morphometrics is an important component of physical anthropometrics, which include the head and face dimensions [4].

Cephalic index (CI) and Prosopic index (PI) are calculated by the following formulas [5,6]:

$$CI = \frac{Head\ width\ [left\ euryon(eu) - right\ eurion\ (eu)]}{Head\ length\ [glabella\ (g) - opisthocranion\ (op)]}\ x\ 100 \quad \text{(Eq.1)}$$

$$PI = \frac{Face\ length\ [nasion\ (n) - gnathion\ (gn)]}{Face\ width\ [left\ zygion\ (zy) - right\ zygion\ (zy)]}\ x\ 100 \quad \text{(Eq.2)}$$

According to CI the following groups can be observed: hyperdolichocephalic (CI ≤ 71.99); dolichocephalic (72.00 ≤ CI ≤ 76.99); mesocephalic (77.00 ≤ CI ≤ 81.99); brachycephalic (82.00 ≤ CI ≤ 86.49); hyperbrachycephalic (86.50 ≤ CI ≤ 91.99); and ultrabrachycephalic (CI ≥ 92.00) [7].

According to PI there are different types of facial forms: hypereuryprosopic (very broad face; PI ≤ 79.9); euryprosopic (broad face; 80 ≤ PI ≤ 84.9); mesoprosopic (round face; 85 ≤ PI ≤ 89.9); leptoprosopic (long face; 90 ≤ PI ≤ 94.9); hyperleptoprosopic (very long face; PI ≥ 95) [8,4].

In the present study, the aim was to investigate correlations between the cranial and facial types and the dento-maxillary anomalies.

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Material and Methods

The study was carried out on 118 patients divided into two groups:

first group was the control group (42 patients without occlusal changes)

second group (76 patients with dento-maxillary anomalies diagnosed based on clinical examination and radiological examination).

The subjects included male and female patients, aged 11-16 (12.06 ± 2.13) years, who came for orthodontic therapy to the Orthodontics Clinic from the University of Medicine and Pharmacy of Craiova. All 118 patients came from Craiova and from localities belonging to counties from South West region of Romania.

Craniofacial measurements, performed by a single observer, were:

-head length (g-op), (glabella - g, opisthocranion - op)

-head breadth (eu-eu), (left euryon – eu, right euryon - eu)

-head height (v-po), (vertex – v, porion - po)

-head circumference (g-g), (glabella – g, glabella - g)

-minimum frontal breadth (ft-ft), (left frontotemporale – ft, right frontotemporale - ft)

-bizygomatic breadth (zy-zy), (left zygion – zy, right zygion - zy)

-bigonial breadth (go-go), (left gonion –go, right gonion -go)

-morphological facial height (n-gn), (nasion –n, gnathion - gn) [4,7].

CI and PI were calculated for each subject using the previously mentioned formulas.

The collected data were tabulated and statistically analyzed with Spearman test for correlation between groups ($r>0.8$ for strong correlation and $p<0.05$ for statistical significance) using the SPSS 16.0 package.

Results.

In the control group, the most common facial shape was mesoprosopic type (24 patients: 57.14%) and the most common head shape was mesocephalic type (24 patients: 57.14%). (Table 1, 2)

Table 1. Head shapes found in the two groups of pacients

HEAD SHAPE	CONTROL GROUP		TEST GROUP	
	n	%	n	%
Dolichocephalic	10	23.8	22	28.85
Mesocephalic	24	57.14	40	52.63
Brachycephalic	6	14.28	10	13.16
Hyperbrachycephalic	2	4.76	4	5.36
Ultrabrachycephalic	0	0	0	0
Sum	42	100	76	100

In the test group, the dento-maxillary anomalies were distributed as follows: dentoalveolar disharmony - 37 patients, maxillary compression - 20 patients, deep covered occlusion – 9 patients, open occlusion – 8 patients and pseudoprognatism – 2 patients.

We did not not identify any cases of hypereuroprosopic type in the control group and just 3 cases (3.95%) in the test group, same number as for hyperleptoprosopic type (Table 2).

Table 2. Face shapes found in the two groups of pacients

FACE SHAPE	CONTROL GROUP		TEST GROUP	
	n	%	n	%
Hyperleptoprosopic	1	2.38	3	3.95
Leptoprosopic	12	28.57	16	21.05
Mesoprosopic	24	57.14	43	56.57
Euryprosopic	5	11.91	11	14.47
Hypereuryprosopic	0	0	3	3.95
Sum	42	100	76	100

As for the head form, we found no ultrabrachycephalic case neither the control group nor in the test group. (Table 1)

The test group revealed the mesocephalic type in 40 patients (52.63%) and the mesoprosopic type in 43 patients (56.57%). We found a strong statistically significant correlation ($r>0.8$, $p<0.05$) between mesocephalic type and dentoalveolar disharmony and maxillary compression anomalies, mesoprosopic type and dentoalveolar disharmony and open bite anomalies, leptoprosopic type and maxillary compression anomalies, and between euryprosopic type and deep bite anomalies. (Table 3, 4)

Table 3. Head shapes according to the dento-maxillary anomaly

DENTO-MAXILLARY ANOMALY	HEAD SHAPES					Sum
	Dolicho-cephalic	Meso-cephalic	Brachy-cephalic	Hyperbrachy-cephalic	Ultrabrachy-cephalic	
Dentoalveolar disharmony	8	18 r>0.8 p<0.05	9	2	0	37
Maxillar compresion syndrome with protrusion	6	13 r>0.8 p<0.05	1	0	0	20
Deep bite syndrome	2	5	0	2	0	9
Open occlusion syndrome	6 r>0.8 p<0.05	2	0	0	0	8
False progenic syndrome	0	2	0	0	0	2
Sum	22	40	10	4	0	76

Table 4. Face shapes according to the dento-maxillary anomaly

DENTO-MAXILLARY ANOMALY	FACE SHAPES					Sum
	Hyper lepto-prosopic	Lepto-prosopic	Meso-prosopic	Eury-prosopic	Hypereury-prosopic	
Dentoalveolar disharmony	0	6	25 r>0.8 p<0.05	6	0	37
Maxillar compresion syndrome with protrusion	3	8 r>0.8 p<0.05	7	0	2	20
Deep bite syndrome	0	0	3	5 r>0.8 p<0.05	1	9
Open occlusion syndrome	0	0	8 r>0.8 p<0.05	0	0	8
False progenic syndrome	0	2	0	0	0	2
Sum	3	16	43	11	3	76

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Discussion

Most common cranial type in our study was mesocephalic type and facial type – mesoprosopic, both in control group and in dento-maxillary anomalies group, characteristic type for the Caucasian race [9].

Leptoprosopic type, associated with a narrow dental arche and an ogival vault, was found especially in patients with maxillary compression and open occlusion syndrome, anomalies commonly associated with oral breathing [10,11].

Euryprosopic type, associated with broad dental arches and a flat, wide palate, was observed particularly in patients with deep bite syndrome.

Results from anthropometric measurements are useful not only to categorise human populations, but also for evaluating intrauterine growth and development, detecting neonatal health problems, and for the assessment of neonatal health status in the first days after birth [5].

Asha et al reported that patients with Down syndrome, could be classified with three variables – CI, index of head size and morphological upper facial index [12].

Many studies have described the characteristics of head forms in different races all over the world: Japan,India, Iran, Netherlands, East Europe, Mongolia, Greenland [13-18].

Face and head form registration based on CI and PI, repeatedly, at intervals over a long period of time, gives information about the time evolution of craniofacial types of a population from a certain geographic area.

There were investigated secular changes in CI over time and the external and internal factors that influence the head form (genetics, environmental factors, psychological and physiological stress, medical care, natural climates, socioeconomic status, and nutrition or diet) in a Japanese population over a 20 years period and there were no significant changes found [7].

The resumption of our study after 5 years, on a double group of patients, showed maintaining characteristics of the geographic area of the sample population, mesoprosopic type and mesocephalic type that we found in the highest proportion in this study were found also in 2009 [19].

There is an assumption that the brachycephalic head form is a consequence of evolutionary forces [20]. On the other hand, some researchers showed there are secular changes in facial shape.

Thus, Hossain MG et al pointed out that the facial form has become narrower during the investigating period, in agreement with Gyenis' and Jantz et al's findings over the facial dimensions of the Americans and the Hungarians. Nevertheless, the results are limited to female data [4, 21, 22].

Conclusions

Craniofacial characteristics remained constant in the interval between the two studies, mesocephalic and mesoprosopic types predominating. The study's resumption at this time repeatedly on larger groups of patients will provide important information about the evolution of dental arch forms, of facial and cranial shapes and about certain dento-maxillary anomalies' share, both in geographical space and in population group.

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