

AGREEMENT BETWEEN ANTHROPOMETRY AND CEPHALOMETRY METHODS IN CLASSIFICATION OF THE FACIAL TYPE

Concordância entre método antropométrico e cefalométrico na classificação do tipo facial

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ABSTRACT

Purpose: to check the correspondence between the facial types of children obtained by facial morphologic index and with the Ricketts VERT index of the cephalometric analysis. **Methods:** 57 children aged between 7 and 12 years old evaluated by orofacial anthropometric evaluation considering measure of facial height and width to obtain facial index and type and by cephalometry were observed the quantity of vertical facial growth. The results were statistical analyzed by weighted up Kappa coefficient. **Results:** there was a poor concurrence between the facial types obtained by two methods. **Conclusion:** the anthropometry is considered an important resource at orofacial morphology evaluation however the facial morphologic index doesn't replace the Ricketts VERT index of the cephalometric analysis to determination of the facial type.

KEYWORDS: Face; Anthropometry; Child

■ INTRODUCTION

To characterize the shape of facial growth that occurs in the vertical and horizontal direction, are described three basic facial types: long face or dolichofacial, medium or short or mesofacial and braquifacial¹⁻³.

The diagnosis of facial types is of great importance in the orofacial myology, considering that each type has its peculiarities and characteristics, evidenced in the shape and configuration of craniofacial structures and dental occlusion, facial harmony and musculature orofacial^{1,2,4}. These aspects directly affect the functions of the stomatognathic system and when properly assessed enable the correct treatment planning, considering the structural possibilities of each case^{1,2,4-6} and avoiding inappropriate generalizations from patterns normality⁴.

To classify the facial type in the vertical plane are used cephalometric and anthropometric and *anthroposcopic* analysis, these latter performed directly on the subject's face or through standardized photographs. However, little is known about the correlation between the results of these assessment methods that are commonly performed independently.

Cephalometry, traditional radiological examination in the study of dentistry to dental-facial structures and craniofacial growth is sovereign to classify the types of face^{7,8}. However, this exam is not easily used by speech therapists, who are not

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able to request them and often are not qualified to interpret them properly, for not knowing the location of craniometric points, facial angles and variations of cephalometric analysis⁹.

Aiming to complement anthroposcopic review, orofacial anthropometric measurement has been widely used in the speech clinic for quantitative assessment of the morphology of the craniofacial complex, especially in the last decade, it consists of simple, non-invasive, inexpensive and easy interpretation method^{10,11}. This assessment, by measuring with caliper rule directly on the face of the patient, it's also allows facial measurements and ratios, to obtain facial type. One of the methods used for this purpose consider the morphological index of the face, from measuring the width and height of the previous face^{5,12-16}.

The purpose of this study was to investigate a possible correlation between facial types of children obtained through the facial morphological index with those obtained by the Ricketts VERT index of the cephalometric analysis, one of the most used.

■ METHODS

This cross-sectional and exploratory study was conducted from the database of a research project in progress. The sample consisted of examinations of 57 children of both genders, ages between 7 and 12 years old, who agree with their participation in the research and had the consent term signed by those responsible.

Anamnesis, clinical examination, orofacial anthropometric and cephalometric reviewed the medical records of all subjects who were established in the age group and had attended the following procedures were included in the study. We excluded those who had a history of speech therapy, orthodontic and/or facial orthopedic treatment, obvious signs of neurological impairment, craniofacial syndromes and malformations.

Anthropometric assessment was performed by the same Speech-Language Pathologist and measurements were obtained directly from the face of the participant, using a metal digital caliper, Digimess Pró-Fono with extensions of 8.25 cm in exterior tips¹³. During the exam, the child remained facing the examiner, in the comfortable sitting position with feet flat on the ground or equivalent support and had anthropometric points previously marked on the skin. The head was held in a natural position, the sealed lips and teeth in centric occlusion¹⁰. Each measurement was performed twice in order to have more reliable results, as recommended by the literature and, for the result

was considered the arithmetical mean in millimeters of two collections accomplished¹⁰.

For this study, measurements of facial height (nasion to the gnathion) and face width (distance between zygions) were considered. The facial type was determined by morphological face index, calculated from the proximate relationship between height and width of the face. This evaluation method classifies faces in^{12,15}:

- Hypereuriprosopic (hiperbrachyfacial) - facial index to 78.9 ;
- Euryprosopic (brachyfacial) - facial index 79 to 83.9 ;
- Mesoprosopic (mesofacial) - facial index 84 to 87.9 ;
- Leptoprosopic (dolichofacial) - facial index 88 to 92.9 ;
- Hyperleptoprosopic (hiperdolicofacial) - facial index above 93 .

For data analysis, we considered three facial types obtained through the facial index. For this the hiperbraquifacial facial types and brachyfacial well as hiperdolicofacial and dolicofacial types were grouped¹⁶.

To obtain the facial types by Ricketts' analysis, the children underwent cephalometric evaluation. This assessment was performed from radiograph in lateral view, with Kodak ® 18x24 cm, chassis for film, coated with Kodak Lanex regular screen , the unit X-Mind with cephalostat for standardization of head position in the emission of rays, at a distance of 1.5 m . On radiographs obtained in lateral view, computerized cephalometric tracing was performed by means of cephalometry CDT program.

To determine the facial type, calculating the Ricketts' VERT index cephalometric analysis, which indicates the amount of vertical facial growth was used. The cephalometric points of this analysis are based in five cephalometric measurements: angle of the facial axis, facial depth, mandibular plane angle, lower facial height and mandibular arch¹⁷.

Based on the values of the angles of the evaluated subject the individualized standard for each angle was calculated, considering the age of the child. After the difference between the set value and the found individual standard, the obtained value was divided by the clinician deviation (which varies with the angle). The VERT index was calculated as the arithmetic average of the five values of face classification. According to the value of this index, the faces are classified em¹⁷ :

- Brachyfacial - value of greater than 0.5 VERT index;
- Mesofacial - VERT index value between -0.5 and +0.5;

- Dolichofacial - value of less than -0.5 VERT index.

This study was approved by the Research Ethics Committee of origin under number 220.0.243.000-8.

The findings of facial type obtained with both methods were statistically analyzed using the weighted Kappa coefficient to analyze the agreement between the methods. The Kappa coefficients were interpreted as¹⁸: poor agreement ($k < 0$), slight agreement ($k = 0-0.20$), poor agreement ($k = 0.21-0.40$), moderate agreement ($k = 0.41$ to 0.60), substantial agreement ($k = 0.60-0.80$) and excellent ($k > 0.80$).

■ RESULTS

The weighted kappa coefficient ($k = 0.188$) showed slight agreement between the two methods. Through descriptive analysis, there was equivalence between facial types obtained through the morphological index of the face and the Ricketts' VERT index of cephalometric analysis in 21 children (36.8%). The equivalence between the methods was observed in almost all brachyfacials children, contrasting with the low correlation between the anthropometric and cephalometric methods in mesofacials and dolichofacials children, according to Table 1.

Table 1 – Absolute and relative frequencies of facial types obtained from the VERT index and morphological index of the face

Facial types – VERT index	Facial types - morphological index of the face					
	Brachyfacial		Mesofacial		Dolichofacial	
	n	%	n	%	n	%
Brachyfacial (n=12)	11	91,67	1	8,33	0	0,00
Mesofacial (n=21)	17	80,95	3	14,28	1	4,77
Dolichofacial (n=24)	14	58,33	3	12,50	7	29,17

■ DISCUSSION

Due to the need to obtain quantitative data for the speech-language therapy practice, the anthropometric evaluation has been increasingly used as a complement to clinical examination in the assessment of orofacial morphology^{6,10,11,14}. Recent studies have been conducted in order to obtain a reliable method for classifying the face by anthropometry^{3,15}, since this technique is easy to use, low-cost and does not expose the patient to radiation.

The methods of obtaining facial type from facial measurements, the facial index is the most cited nowadays^{5,12-16}, although it is an old and without much scientific evidence of its accuracy method.

The results obtained in this study showed that there is a slight correlation between the results of this technique with those obtained by Ricketts' VERT index.

Perhaps one reason for this result is the different head positions taken during the performance rating, since the angular measurements used to calculate the VERT index may change according to the head position. In traditional cephalometric evaluation is performed on the correct head position during

the taking of the radiograph, with the Frankfurt plane parallel to the ground through cephalostat while obtaining anthropometric measurement is performed with the head in a natural position.

There is scientific evidence that may have differences in facial analysis depending on the positioning of the head during the exam, because often the natural posture of the head does not coincide with the Frankfurt plane in horizontal¹⁹.

In a study¹⁵ conducted with children the authors found a correlation between the results of the assessment of facial performed by analyzing Ricketts and Ávila method¹², and claim that they can be used independently. However, in this study, the measurement of facial height and width, which allowed the calculation of the facial index, was performed in front cephalometries and not directly on the face of the subject, as in the present. Obtaining correlation between the findings of both methods in the initial research might be explained by the frontal and lateral radiographs were performed in the same manner or both with the head in a natural position, which can support that the head posture influences the findings of facial type.

Thus, it is suggested that further investigations, considering the natural head position during

cephalometric evaluation are conducted in order to verify this hypothesis. It is considered feasible such investigations, given that research in the area of orthodontics have shown that the natural head posture is reproducible in different radiographs, and allows a safer and closer planning to the reality of patients¹⁹.

Another justification for the evaluation methods presented slight agreement would be considered the number of quantities in each of the indexes and also the fact that the VERT index is calculated from measurements on lateral radiographs, while the facial index is measured directly in the subject's face in frontal view. In this case, the facial asymmetry evidenced in frontal view could affect the results for the measures of height and width, while the radiographic considers only one side for measurements²⁰.

A survey recent³ considered different anthropometric measurements of the present study to determine the type of facial adults and compared these measures with cephalometric findings. In this, the authors showed that in general the tested anthropometric variables showed good predictive ability to determine the facial types, compared to cephalometric analysis³, findings that are consistent with those obtained in the present study.

To justify the findings of this study should also consider that there can contain errors in all anthropometric methods, and the misidentification of craniofacial and marking points are frequent and can compromise the findings of studies²¹. Hence the importance of reproducibility studies in anthropometry²². Although the orofacial motor is most often applied to mean absolute differences with the aim of increasing the accuracy measurements²³, errors

of a few millimeters can have a major impact on the results. Furthermore, small deformations in the mushy tissue²³ may occur during the measurement with caliper rule, which may also have influenced the results of this study.

In the literature, studies with similar objectives, the sample included subjects without stomatognathic changes⁴ or separated into distinct groups, subjects with and without such alterations¹⁵. However, in view of the purpose of verifying the correspondence between the methods of assessment, this separation is considered irrelevant because the same or similar facial type of a same subject will result if the techniques are equivalent, regardless of the alteration that were submitted.

Based on the findings of this study, it is suggested that the classification facial type through facial anthropometric index to be used with caution, moreover, new studies are conducted with different methodologies to verify the accuracy of anthropometry in determining the types facial.

■ CONCLUSION

The results of this study showed slight agreement between facial types obtained through the morphological index of the face with those obtained by Ricketts' cephalometric analysis, the age group studied. Therefore, it is considered that although anthropometry already incorporated and consolidated as an important feature in the examination of independent judges, their use for the determination of facial from facial height and width does not replace the Ricketts' VERT index cephalometric analysis.

RESUMO

Objetivo: verificar a correspondência entre os tipos faciais de crianças, obtidos por meio do índice morfológico da face e com o índice VERT da análise cefalométrica de Ricketts. **Métodos:** 57 crianças entre 7 e 12 anos foram avaliadas por meio de avaliação antropométrica orofacial, em que foram consideradas as medidas de altura e largura facial para obtenção do índice e tipo facial, e pela cefalometria, na qual foi observada a quantidade de crescimento vertical da face. Os resultados foram analisados estatisticamente por meio do coeficiente Kappa ponderado. **Resultados:** houve uma concordância fraca entre os tipos faciais obtidos por meio dos dois métodos. **Conclusão:** a antropometria é considerada um importante recurso no exame de motricidade orofacial, entretanto o índice facial não substitui o índice VERT da análise cefalométrica de Ricketts para determinação do tipo facial.

DESCRITORES: Face; Antropometria; Criança

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