Concurrence between Interpupillary Line and Tangent to the Incisal Edge of the Upper Central Incisor Teeth

FABIANO MARTINS MALAFAIA, DDS, MSC* MARCELO FRANCISCO GARBOSSA, DDS, MSc[†] ANA CHRISTINA CLARO NEVES, DDS, MSc, PhD[‡] LAÍS REGIANE DA SILVA-CONCÍLIO, DDS, MSc, PhD[§] MAXIMILIANO PIERO NEISSER, DDS, MSc, PhD[§]

ABSTRACT

Objective: Dento-facial harmony is essential to obtain adequate esthetics and a successful treatment. Therefore, the aim of the present study was to analyze the existence of polar symmetry, obtained by two parallel lines, one along the pupils and another along the incisal edge of the upper central incisor teeth of 102 dental students distributed across five Brazilian dental schools.

Materials and Methods: One hundred and two students with no missing teeth, who had never been subjected to any kind of dental treatment, not even orthodontic treatment, were selected and photographed using a dental eye II camera (Yashica-Kyocera Optics Inc., Somerset, NJ, USA) with a macro-objective lens of 100 mm and using a scale of 1:10 of the natural size. All the individuals were positioned parallel to the plane of Frankfurt and to the ground, and were photographed smiling in order to expose the central incisors. The pictures were transformed into digital images (1,840 × 1,252 pixels) and analyzed later using Microsoft Office Power Point 2007 software. Two lines (along the pupils and another along the maxillary incisive teeth) were drawn, and the inclination obtained was generated by the program itself. Symmetrical cases were classified as "yes" (Y), and the remainder as "no" (N). Cases were also divided according to gender. Results were statistically assessed by analysis of variance and Student's *t*-test ($\alpha = 0.05$).

Results: There was a statistically significant correlation between the line parallel with the pupils and the tangent of the incisal edge of the incisors, irrespective of gender.

Conclusion: Regardless of gender, there is a correlation between the pupils and the tangent with the incisal edge of the maxillary central incisors.

CLINICAL SIGNIFICANCE

Despite diversity in individuals, facial and anatomic measurements may aid in the execution and planning of rehabilitation treatments.

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*Postgraduate student, Department of Dentistry, University of Taubate, Taubate, SP, Brazil [†]Postgraduate student, Department of Dentistry, University of Taubate, Taubate, SP, Brazil [‡]Associate professor, Department of Dentistry, University of Taubate, Taubate, SP, Brazil [§]Associate professor, Department of Dentistry, University of Taubate, Taubate, SP, Brazil [¶]Associate professor, Department of Dentistry, University of Taubate, Taubate, SP, Brazil INTRODUCTION

The polar symmetry, or symmetry in relation to a certain point, is one of the factors that contribute to facial harmony. Its application in rehabilitation treatments can determine the success or failure of a natural restoration. Symmetry is one of the key factors that contribute to an attractive smile.¹ Generally, the human face is not symmetrical (disproportion and anatomic deviations can be observed), and this should be taken into consideration when a rehabilitation treatment is to be initiated.² In dentistry, the use of well-defined proportions is extremely important for the esthetic and function of the stomatognatic system.³ During prosthesis restoration treatment, dentists endeavor to establish a relationship between the prosthesis being manufactured, and the craniometrical and facial ratios of the patients being prosthetically rehabilitated, with a view to the achievement of functional and esthetic harmony in oral rehabilitation.

Many planes and points of the skull can be used as references for the confection of dental prostheses, including the Camper Plane, Frankfurt Plane, and the orbital (both pupils).^{4,5} Anatomic measurements are used to evaluate the cranio-dental–facial distance⁶ and aid in the planning of orthodontic, prosthetic, or restorative treatment, with the objective of obtaining satisfactory esthetics. One of these measurements includes the distance between the pupils and the determination of the medium line.^{7,8} However, it should be pointed out that patients must be compared with others of equivalent age, gender, and race, considering the deviations of normality.⁹⁻¹¹

The study of the relationship between the incisors and the orbital plane is characterized by the need for a practical approach for the verification of possible facial relationships by a general clinic dentist. Because most studies report the relationship between the occlusal plane and bipupilary plane, this potential new reference line could prove useful in the esthetic restorative treatment of anterior teeth.

Thus, the aim of the present study was to verify facial symmetry by comparing presence (true hypothesis) and absence (null hypothesis) of parallelism between the pupil line and the tangent of the incisal edge of the maxillary central incisors.

MATERIALS AND METHODS

One hundred and two students from five dentistry colleges were selected. All subjects signed a document of free and informed consent to participate in the research, and granted the right to use their images. The students were males and females, aged from 20 to 25 years old. All individuals selected for this study were previously submitted to clinical examination. Those that presented partial or complete absence of teeth; periodontal disease; esthetic restorations involving the edge of the maxillary incisive teeth; artificial crowns; and history of orthodontic and/or orthopedic appliance use, congenital facial anomalies, or facial surgery were excluded from the study.

Obtaining Images

After having read and signed the free and informed consent form, all the individuals were positioned parallel to the plane of Frankfurt and to the ground, and were photographed smiling in order to expose the central incisors. One hundred and two photographs were taken using the Dental Eye III (Yashica-Kyocera Optics Inc., Somerset, NJ, USA) camera with a macroobjective lens of 100 mm and using a scale of 1:10 of the natural size. Images were recorded on 35-mm film (Ektachrome ASA/ISO 100, Kodak Inc., São José dos Campos, São Paulo, Brazil), and photos were transformed into digital images of $1,840 \times 1,232$ pixels.

Image Analyses

The images were visualized using the Microsoft PowerPoint 2007



Figure 1. Coincidence (A) or absence of coincidence (B) of parallelism between pupil line and the tangent of the incisal edge of the maxillary central incisors.





Figure 2. Distribution of the results (percentage) according to presence (yes) or absence of parallelism (no).

Figure 3. Distribution (percentage) of the results in relation to gender.

(Microsoft Corp., Redmond, WA, USA) software, magnified three times and, using the line tool, two lines were traced: line 1, horizontal, from pupil to pupil; and line 2, horizontal, passing by the incisal edge of the upper central incisor teeth (Figure 1). The obtained inclination was generated by the program itself. A single person was responsible for this process. According to inclination of the lines, the subjects were classified into two groups: individuals that presented parallelism between the lines obtained were included in the "yes" (Y) group, and individuals that did not present parallelism were included in the "no" (N) group (Figure 2). The subjects were also grouped according to gender (male/female) for analysis based on gender (Figure 3).

RESULTS

Results showed that 70.59% of the population demonstrated parallelism, and 29.41% did not demonstrate parallelism. According to gender, parallelism can be observed in 40.28% of men and 59.72% of women. Statistical difference was demonstrated when comparing the number of Y and N samples, p = 0.00, as well as the genders. The correlation of parallelism

TABLE 1. NUMERICAL DISTRIBUTION OF THE RESULTS OBSERVED.					
	Number of samples (n)	%	Gender	Quantity (n) in each group	%
Yes	72*	70.59	Men	29**	40.28
			Women	43**	59.72
No	30*	29.41	Men	7	23.33
			Women	23	76.67
Statistical significant difference: $*p = 0.000$ and $**p = 0.020$.					

between genders presented a relevance of p = 0.200. As such, the null hypothesis cannot be discarded (Ho) (Table 1).

DISCUSSION

The widespread use of photographic techniques in dental clinics provides an important analysis tool that contributes to the results of treatments. The use of computer software for interpretation analysis should be encouraged because such methods provide excellent conditions of work, enhancing the predictability and the understanding of the treatment by the patient. However, such software requires training and practice by a competent operator to obtain results accurately. The PowerPoint program was chosen because of its reduced price, widespread utilization, ease of use, and the tool line of the software used in this study for verification of parallelism among straight lines is sufficient to determine the outcome of the images for the results.

Facial symmetry itself may not be a key factor in statistical achievement. However, high levels of deviations may be considered esthetic alterations. In many buccal rehabilitation studies, facial lines are utilized as references. These anatomic facial distances must be analyzed individually in order to facilitate assembling. To facilitate the assembly of the teeth of a dental prosthesis, the occlusal plane must be associated with the lobular plane of the ears to facilitate the manufacture of the prosthetic apparatus;12 however, in most cases, the ears are not necessarily coincident with the interpupillary line, and the earbrow can be reoriented to coincide with this. Similarly, there should be proportion between the widest part of the nose and the anterior teeth of the superior arcade.13

The use of a correct configuration of the anatomical planes is associated with esthetic excellence, as well as a better function of the stomatognatic system, because of the relationship that exists between the craniofacial plane and the presence of

temporomandibular disorders.¹⁴ Measurements and proportions were developed in order to evaluate the cranio-bite-facial distances: however, it should be emphasized that patients should be compared with their equivalents in age, gender, and race, evaluating deviations of the normality.¹⁰ The interpupillary distance and its relationship with other anatomical structures can be used as a reference in treatments but measured in an individual manner.3,15 Another anatomical measurement, such as intercomissure distance, bizygomatic distance, and interpupillary distance, may be used as an aid in the determination of the anterior teeth and of the dental arch in oral rehabilitations.^{11,14,16,17} Some authors have suggested a relationship between the superior central incisive and interpupillary distance.^{11,17} Such suggestions for the use of anatomical measurements should be repeated in varied populations to compensate ethnic differences. Our study was conducted in the Brazilian population, which constitutes a miscegenated population.

Patient positioning during photographic capture is important because it is known that the bipupillary plane should be parallel to the occlusal plane when these are analyzed jointly during observation of the patient in the frontal perspective.^{18,19} The results obtained, in accordance with recent studies,^{11,13,14,17} suggest that methods based on the relationship of the anterior teeth with some facial measurements should be used as preliminary guides in the estimation of the characteristics of the anterior superior teeth.

CONCLUSION

A statistically significant correlation exists between the bipupillary plane and the tangent to the incisal edge of the upper central incisors. This condition is verified as true, independently of gender.

DISCLOSURE

The authors do not have any financial interest in the companies whose materials are included in this article.

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Reprint requests: Laís Regiane Silva-Concílio, DDS, MSc, PhD, Rua: Expedicionário Ernesto Pereira, 110, Centro—Taubaté, São Paulo, Brazil 12020-330; Tel: 00-55-12-3625-4149; Fax: 00-55-12-3635-4968; email: regiane1@yahoo.com

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