

ORIGINAL ARTICLE

Digitalizing Aesthetics in Prosthetics, Correlating Face with Tooth Form

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Abstract

Aim: The purpose of this study was to generate the computer based programme which will prove its efficacy in analysis of the co-relation between aesthetic factors i.e. face form, tooth form and relative size ratio and to evaluate the same in the Indian population. **Material & Method:** Two hundred undergraduate dental students (100 males and 100 females) whose age ranged between 20-25 years having healthy natural central incisors with minimal restorations were selected. A digital camera SONY DSC-H55 with 14 megapixels was used for the study. Customized software was developed with the help of a software engineer. Using a standardized procedure, three photographs of full face, central maxillary incisor, and face with maxillary incisor teeth were clicked. Photographs were uploaded in the software and a) Analysis of face form versus tooth form (Qualitative analysis). b) Analysis of Relative size ratio (Quantitative analysis) was done by following multiple tabs in a sequential manner. **Results:** The qualitative analysis revealed only 23% correlation between face and inverted tooth form. Quantitative analysis revealed the Relative Size Ratio of face and teeth was in the range of 13 to 16 for females and 15 to 16 for males. **Conclusion:** Insignificant co-relation was found between Face form and teeth form on Indian population and a particular range of relative size ratio of Bizygomatic width to width of maxillary central incisors was observed, which varied based on gender.

Keywords: Esthetics, Software, Relative size ratio

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Introduction

Loss of anterior teeth is a social and a psychological trauma for the patient and their replacement with artificial restorations is challenging as their choice which takes many parameters such as size, shape and shade into account. Many methods have been suggested for a crucial teeth selection process.¹⁻⁶ With the advancement of technology, the use of computers and software can help to design a reliable method, correlating various esthetic parameters, which may ease teeth selection.

Materials and Methods

Two hundred undergraduate dental students (100 males and 100 females) whose age ranged between 20-25 years having healthy natural central incisors with minimal restorations were selected. Those having major restorations,

significant overjet and attrition were excluded. Using a standardized procedure with fixed distance, magnification, megapixels, three photographs of full face, central maxillary incisor, and face with maxillary incisor teeth were clicked. A digital camera SONY DSC-H55 with 14 megapixels was used for the study. For the study, customised software was developed with the help of a software engineer. Photographs were uploaded in the software and they were analysed using the following protocol. a) Analysis of face form versus tooth form. b) Analysis of Relative size ratio.

The computer software was designed which included multiple tabs which needed to be followed in a sequential manner. At first facial image is uploaded in the software after which a tab when clicked inserted ruled gridlines. With the help of 08 orthognathic anatomical points, namely symphysis menti, bilateral angles of mandible, bilateral zygomatic prominences,

bilateral maximum curvatures of the bosses of the temple, and , midpoint of hairline, facial outline was plotted in the software (Figure 1). The next step was deleting the gridlines on the image followed by clearing facial image. Subsequently, inverted image of the central incisor, was uploaded. Gridlines were inserted by clicking the “insert gridlines” tab. Using 08 anatomical points on the incisor, namely, Cervical midpoint, bilateral gingival curves, bilateral contact points with adjacent teeth, bilateral incisor angles, and, midpoint of incisal surface, incisor outline was plotted in the software (Figure 2). The next step was deleting the gridlines on the image followed by clearing the tooth image.

Now the two saved outlines were superimposed and compared in the software which provided qualitative data in the form of YES or NO which corresponded to SIMILAR and DISSIMILAR respectively (Figure 3). The outline tracing lying between 60-80% superimposition is considered similar. Superimposition of 50% and less is considered dissimilar.

After this qualitative analysis, face to teeth ratio were compared quantitatively, which required returning to the home page of the software and clicking a tab named compare “Face and Teeth Ratio”. At first, the third image of face with anterior teeth of the subject is uploaded in the software followed by insertion of the gridlines. Two selected facial points (bilateral zygomatic prominences), and width of the two maxillary central incisors, were marked by clicking the tab “mark facial points” and “mark teeth points” respectively (Figure 4). The relative size ratio between face and teeth was measured by clicking the tab “COMPARE”. The values were recorded for each subject and tabulated.

Results

The results of superimposing outline forms between face form and inverted tooth form are calculated in terms of percentage with the help of computer software. They basically correspond into two similar and dissimilar. The outline tracing lying between 60-80% superimposition is considered similar. Superimposition of 50% and less is considered dissimilar. The qualitative analysis revealed only 23% correlation between face and inverted tooth form. Quantitative analysis revealed the Relative Size Ratio of face

and teeth was in the range of 13 to 16 for females and 15 to 16 for males.

Discussion

De Van believed that prosthesis should establish the best possible appearance of a patient at the moment of treatment and therefore logically the “apparent” face should be employed. ⁽⁷⁾

During the second half of the nineteenth and early twentieth century “temperament of the patient” was popularly accepted theory and the selection of teeth for prosthetic dentistry were made based on this theory. Temperamental types were sanguine, nervous, bilious, and lymphatic, named after the physiologic functions of blood, nerves, bile, and lymph. Artificial teeth were arbitrarily selected to fit the patient’s temperament. ⁽⁸⁾

However, it was Williams ⁽⁹⁾ who, after rejecting the “temperamental theory” with anthropologic arguments, formulated and publicized a method called the “law of harmony” which is still widely used. Williams believed that a relationship exists between the face-form and the form of the maxillary central incisor in most people and that this relationship should be taken into account in the tooth selection procedure. He described three “typal” or “basic” forms of teeth tapering, ovoid, and square and some intermediate and composite forms.

Later, many systems developed for tooth selection were based on simplified versions of Williams’ hypothesis. Although this method or variations of it have been widely used for tooth selection, it cannot claim to achieve entirely satisfactory esthetic results. It was indicated that harmony appeared to exist between the proportions of the teeth and those of the face.

One of the methods introduced by the Dentist’s Supply Company employed an “indicator” instrument for establishing the patient’s facial outline. Another technique, suggested by the Austenal Company, using the “Automatic Instant Selector Guide” correlated form, size, and appearance so that only one reading was needed for the selection of the “correct” tooth. However, no information could be found which explained the details of this technique.

Wright ⁽¹⁰⁾ suggested the use of old photographs of the patients’ natural teeth. Krajicek ⁽¹¹⁾ and others proposed methods involving the

duplication of the patient's natural teeth either before or after extraction.

Some suggested incorporating the patient's natural teeth in the denture and recorded techniques to overcome the bonding problems between natural teeth and denture base materials.

Frush and Fisher ⁽¹²⁾ in a series of articles under the title "Dentogenic Dentures," tried to establish a new concept in denture esthetics by combining tooth selection stages with a further individualization of the teeth according to sex, personality, and age.

They claimed that if these three qualities were correctly interpreted, the dentures would have a natural appearance.

Lee's ⁽¹³⁾ ideas on denture esthetics were based on Williams "law of harmony" but elaborated further by consideration of additional anatomic features and suggested modification of the incisal edges and cervical dimensions according to the related widths of the forehead and the mandible.

Conclusion

The purpose of this study was to generate the computer based programme which will prove its efficacy in analysis of the co-relation between esthetic factors. Only 23% displayed similarity between face form and teeth form, while 77 % were dissimilar. The results of the study do not support the "Law of Harmony" suggested by Williams. Insignificant co-relation was found between Face form and teeth form on Indian population which was in accordance with the similar studies conducted by G M Ritchie and Mavroskoufis ⁽¹⁴⁾, Wright WH ⁽¹⁰⁾, Bell RA ⁽¹⁵⁾. However, despite the dissimilarity between face form and teeth form – harmony in dento-facial esthetics still exists. In a given Indian population a particular range of relative size ratio of Bizygomatic width to width of maxillary central incisors was observed, which varied based on gender.

Conflict of Interest: None declared

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