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Research Article

Conformal Symmetry in the Structure of Permanent Teeth of Adult Person

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Abstract

The article under consideration daeals to the points connected with the usage of the knowledge of the “golden” wurf as a coefficient, which provides the opportunity for the most accurate dentition symmetry in the process of aesthetic tooth restoration.

Keywords: Tooth; Symmetry; wurf; Aesthetic Restoration

Introduction

Geometric proportions of the lengths in the three-membered body units are represented as the "golden" wurf, which is equal to a double ratio of four points, or of three segments of the straight line ABCD: AB, BC, CD, having the features not to alter under conformal transformation, and with the limit value of 1,309 [1,2]. While conformal transformations change both the size and the shape of the body. The transformation of the entire set of points of the body could be determined by the transformation of the points in general position [3]. As well as the golden section the "golden" wurf being embodied in geometric forms, allows to specify a new principle or system for constructing the aesthetic proportions [4]. Odontometry coupled with the knowledge of Golden proportions allows you to make the best decision in the presence of optical illusions that affect the assessment of the defect size and the amount of future restoration. It plays highly significant role, especially in clinical cases [5,6].

Research objective

To estimate the significance of the wurfs and the usage of the conformal symmetry principle in the structure of permanent teeth of both upper and lower jaws of the adults.

Materials and Methods of Research

The study included measurements of the linear values of the teeth of both upper and lower jaws: crown height, crown width and root length. Adult teeth were considered as the objects of the study: incisors - in the amount of 15 samples: 7 incisors of the upper jaw and 8 incisors of the lower jaw, fangs: 10 samples of the upper jaw and 9 pieces of the lower, and premolars: 12 samples of the lower jaw were analyzed and 15 samples of the upper. The presence of the Golden section or deviation from it was analyzed in these samples of teeth. 5% deviation was determined as acceptable deviation from the "Golden" wurf according to S. V. Petukhov; in numerical equivalents it corresponds to = 1,309 ± 0,065 [1].

The wurfs were calculated, including indicators reflecting the structure of each tooth. The results were compared with the "golden" wurf.

The formula for calculating the wurfs suggested by S.V. Petukhov was used:

$$W = \frac{(AB + BC)(BC + CD)}{BC(AB + BC + CD)}$$

in which AB - is the largest trinomial, BC- is the average trinomial, CD - is the smallest trinomial of the straight line [1].

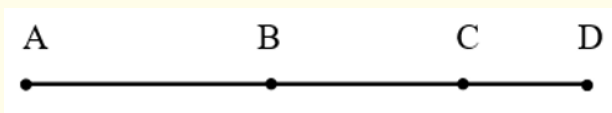

Figure a

In this case, the height of the root was considered as AB values, the height of the crown - as BC, the CD - is the width of the tooth crown. The results were compared with the "Golden" wurf equals to 1,309.

Research Results and Discussion

When measuring the lateral and medial incisors with calculating the value of the wurf, the teeth of both upper and lower jaws were considered separately. By the way, the average dimensions of the crown and the root heights, as well as the crown width were recorded.

When calculating the wurfs for the upper jaw incisors, the average values for the segments given were calculated: AB = 14,8mm, BC = 10mm, CD = 8mm.

Using these values in the formula for calculating the wurf, its value equals to 1.36:

$$W = \frac{(14.8 + 10)(10 + 8)}{10(14.8 + 10 + 8)} = 1.36$$

The average value for this group is approximately equal to the “golden” wurf, the deviation from it corresponds to the allowable one.

Determining the wurf value for the incisors of the mandible, the average values for the segments were as follows: AB = 13 mm, BC = 9.25 mm, CD = 6.75 mm. Substituting the data and determining the wurf, we`ve calculated:

$$W = \frac{(13 + 9.25)(9.25 + 6.75)}{9.25(13 + 9.25 + 6.75)} = 1.33$$

The average wurf value for this group is very close to the “golden wurf”.

When measuring fangs, the teeth of the upper and the lower jaws were examined separately. The average values of the crown`s height and the root`s height, the width of the fang`s crowns of the upper jaw were calculated: AB = 15 mm, BC = 10.5 mm, CD = 7.5 mm. Based on the results, the wurf was calculated:

$$W = \frac{(15 + 10.5)(10.5 + 7.5)}{10.5(15 + 10.5 + 7.5)} = 1.32$$

The average wurf value for the group of fangs of the upper jaw is approximately equal to the "golden" wurf.

Carrying out calculations for the fangs of the lower jaw, we measured the average values for each of the straight line segments: AB = 14.5 mm, BC = 9.75 mm, CD = 6 mm. Substituting them into the formula for calculating wurfs, we got:

$$W = \frac{(14.5 + 9.75)(9.75 + 6)}{9.75(14.5 + 9.75 + 6)} = 1.29$$

The average value of the wurf for the fangs of the mandible is in the range of values equal to the "golden" wurf.

When measuring the premolars, the average values of the upper and lower jaws teeth were similarly determined. Anatomical and morphological features and differences in the structure of the teeth were taken into account: the lower premolars differ in form and size from the upper ones, - they are much smaller than the upper ones and have a round crown form. They have different bumps on the chewing surface. The crown of the lower molars often is located at an angle to the root, opened to the oral cavity. For the upper jaw, the average premolar values were as follows: AB = 14 mm, BC = 11 mm, CD = 8.5 mm. Measurement data were substituted into the wurf formula:

$$W = \frac{(14 + 11)(11 + 8.5)}{11(14 + 11 + 8.5)} = 1.32$$

The average value of the wurf in the group of upper premolars is close to the “golden” wurf.

When measuring the wurf for premolars of the mandible, the following average values were obtained: AB = 12.6 mm, BC = 8.8 mm, CD = 6.8 mm. Substituting the these values and calculating the wurf, we got:

$$W = \frac{(12.6 + 8.8)(8.8 + 6.8)}{8.8(12.6 + 8.8 + 6.8)} = 1.34$$

The value of the wurf for premolars of the mandible is approximately equal to the "golden" wurf.

Determining the proportions of different parts of the human body has always attracted the attention of artists, sculptors, biologists. Measurements of the proportions of human body parts have traditionally been carried out on the basis of affine (simple) ratio between the figures of two anatomical measurements. However, the human body cannot be reduced only to the proportions of two-member structures [7]. The study of the laws and algorithms of organic shaping is one of the important areas of developmental biology. Many organic bodies are built on the principle of multi-stage symmetry blocks, which is manifested in the kinematic scheme of the human body. The monograph issue "Biomechanics, bionics and symmetry" by S.V. Petukhov (1981) was a step forward in the study

of morphogenesis. The author used three segments of measured formations to calculate conformal symmetries. According to S.V. Petukhov, all three-member kinematic chains of the human body obey the rule of the "golden wurf" [1].

Based on the above theoretical prerequisites, we have conducted anthropometric studies of human permanent teeth: incisors, fangs, small molars of the upper and lower jaws. The studies have shown that the structure of the permanent teeth of an adult (incisors, fangs and premolars of the upper and lower jaws) obeys the laws of conformal symmetry. The Golden Wurf is a three-member canon not only of the human body in general, but also of its teeth.

The average value of wurfs of three-member kinematic blocks of teeth corresponds to the value of the "golden wurf". Wurf W = 1.309 is an invariant of the modified sequence of Fibonacci numbers [8].

Conclusions

1. Measuring the height of the root and crown and the width of the crown, calculating the wurf predetermine the choice of the geometric shape for the tooth restoration to maintain symmetry with respect to the entire tooth row [9], taking into account the individual characteristics of the macro- and microrelief of the vestibular surfaces of the tooth.
2. Researches in this area could indicate new prospects in dentistry and medicine in general. The golden wurf itself can be considered as a three-member canon of the human body, and the system of building aesthetic proportions as a golden wurf system.

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