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SQUARE, SQUARE-TAPERED AND TRIANGULAR TOOTH SHAPE: PERIODONTAL PHENOTYPE DETERMINANTS.

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ABSTRACT

Background: It has been long known that the clinical appearance of healthy marginal periodontium differs from subject to subject and even among different tooth types. Many features are genetically determined; others seem to be influenced by tooth size, shape and position and biological phenomena such as gender, growth and age.

Aim: To assess correlation between different tooth shapes and gingival and periodontal characteristics.

Material and Methods: 60 subjects (34 females & 26 males) were included in the study. Clinical measurements; width and height of maxillary central incisors, extent of the keratinized mucosa (KM), gingival thickness (GT), depth of the sulcus (SD), bone-sounding depth (BS) and height of interproximal maxillary central papilla (Ph),contact surface length(CS) were assessed. Subjects were then divided into three groups based on the shape of maxillary central incisors: triangular; square; or square-tapered. The measurements were recorded and subjected to statistical analysis.

Results: There were no significant differences among the three groups in terms of the SD (p = 0.178), the BS (p = 0.183), extent of KM (p=0.356) whilst statistically significant differences were observed for the GT (p = 0.001), Ph (p =0.001), contact surface length (p =0.001); height and width of the crown (p=0.002, p=0.033).

Conclusion: Different tooth shapes are associated with significantly different values for its GT, with the Ph, contact surface length; height of the crown; and width of the crown.

KEYWORDS : . gingival thickness, keratinized mucosa, tooth shape

INTRODUCTION

A correlation between the shape of the maxillary central incisors and periodontal features typical of the various gingival phenotypes has been reported in the literature[1]. Normally, there is a considerable intra-individual and inter-individual variation in both width (Seibert & Lindhe 1989) and thickness of the facial gingiva (Olsson & Lindhe 1991), a fact that gives rise to the assumption that different gingival phenotypes might exist in any adult population.

Genotype is defined as an organism's full hereditary information; biotype is defined as a group of individuals who have the same genotype; and phenotype is defined as an organism's actual observed properties, such as morphology, development or behavior (The Oxford English Dictionary [OED], Oxford University, 2nd revised edition). The term "phenotype" was used because it best described the shape of the teeth and the alveolar process discussed in this paper.

In particular, teeth with elongated crowns and short contact surfaces are associated with a thin, highly scalloped, gingival architecture and a thin maxillary alveolar bone, whilst teeth with square crowns and long contact surfaces are associated with a thick, flat, gingival architecture and a thick maxillary alveolar bone[2]. The shape of the teeth is re¬lated to the thickness of the gingiva and surrounding bone[3,1].

Establishing the gingival phenotype of a patient will aid immeasurably in communications among the dental surgeon, the restorative dentist, the dental laboratory and the patient. Moreover, tooth shape is a critical factor when dental-implant prostheses are considered in the esthetic zone. Anticipating treatment limitations by understanding the morphologic characteristics of the underlying bone is an important phase of the treatment planning discussion with a patient. It is important to consider phenotype when planning treatment, as a thin gingival margin is more prone to gingival recession [4,5]. This is particularly relevant after the placement of dental implants6 as the gingival margin is less stable in the long term[7]. Moreover, a thin gingival margin has shown a higher failure rate after periodontal therapy8 and less stability with the prosthetic margins[9]

The ratio between the length of the contact surface and the length of the crown thus provides parameters for defining a tooth as triangular, square-tapered or square.

$$\text{Type of toothshape}[10] = \frac{\text{Length of the contact surface}}{\text{Length of the crown}}$$

Triangular <43%, Square>53%, Square-tapered 43-57%

However it does not consider; how these tooth-shape groups correlate with the gingival parameters most commonly used to define an individual's periodontal phenotype[4,5] such as the bucco-lingual thickness, the extent of free and attached gingiva and the height of the interproximal maxillary central papilla. According to literature very few studies have assessed the correlation between toothshape and periodontal phenotype. Hence, a study was conducted to assess the correlation between maxillary central incisor tooth shape and gingival and periodontal characteristics.

MATERIALS AND METHOD

60 subjects (26men and 34women); age range, 18–30 years were selected. A detailed case history of the subjects participating in the study was recorded. Signed informed consent was obtained before the start of the study.

Systemically healthy and co-operative subjects with bilateral maxillary permanent central incisors, good oral hygiene (OHI score ≤ 0-1.2), clinically healthy gingiva (GI score ≤ 0-1), and probing depth <3mm were included in the study.

Presence of incisal abrasion, attrition or erosion, Sub-gingival restoration or replacement of the maxillary central incisors, history of tooth trauma, orthodontic treatment, periodontal surgery, extensive restorations, evidence of caries, history of intake of systemic medication were excluded from study.

For each patient, age, gender were recorded. Photographs were taken of each subject's mouth with the aid of a mouth prop and a millimeter-graduated ruler positioned immediately below the incisal margins of the central maxillary teeth. This provided a reference scale for the measurements subsequently recorded on a computer "resolution 1680 × 1050 pixels" using Adobe Photoshop

Clinical parameters like width and height of maxillary central incisors, extent of the keratinized mucosa(KM), gingival thickness(GT), depth of the sulcus(SD), bone-sounding depth(BS) and height of interproximal maxillary central papilla (Ph), contact surface length(CS) were assessed by the same operator 1 week after reinforcement of oral-hygiene instructions to the patients. The parameters were measured on the vestibular surface of one of the two central incisors, 10 min after the infiltration with 2% lignocaine (1:80000 adrenaline).

The extent of KM was measured from the free gingival margin to the muco-gingival junction identified using the roll technique, SD was measured using a Williams Periodontal probe, BS (i.e. the distance from the free gingival margin to the alveolar bone crest) was measured using a Williams periodontal probe; the bucco-lingual GT was measured using Vernier caliper. This location was identified with a needle fitted with a rubber stop, at the connective tissue interface, the position of which was calculated by subtracting the SD from the BS; the height of the crown(H) was measured from the most apical part of the gingival margin (zenith) to the most coronal point on the incisor margin, the width of the crown(W) was measured by dividing the height of the tooth into three equal portions and measuring them horizontally at the boundary between the apical third and the median third, using the "Ruler" in Adobe Photoshop.

RESULTS:

Parameters	Different tooth shape			P value
	Square n=19 (M=8,F=11)	Triangular n=21 (M=8,F=13)	Square-tapered n=20(M=10,F=10)	
Age, in years (Mean±S.D.)	24.11±2.58	23.90±2.59	23.75±2.57	0.912
KM in mm	4.71±0.28	4.71±0.33	4.83±0.27	0.356
GT in mm	1.60±0.16	1.47±0.008	1.61±0.14	0.001*
H in mm	9.68±1.25	10.19±0.81	11±1.30	0.002*
W in mm	8.32±1.00	8.43±0.93	9.20±1.40	0.033*
CS in mm	5.74±0.87	3.67±0.86	5.40±0.75	0.001*
Ph in mm	3.84±0.60	4.52±0.81	3.70±0.73	0.001*
BS in mm	2.53±0.51	2.81±0.43	2.70±0.50	0.183

* P≤0.05 is statistically significant.

Statistically significant differences were observed for the GT (p = 0.001), Ph (p =0.001), CS (p =0.001); height and width of the crown (p=0.002, p=0.033).

DISCUSSION:

In the present study, correlations between tooth shape and variables such as gender and age were assessed.

Correlation between gender predilection and tooth shape was non significant (p = 0.741).

Muller HP et al 2000[2], De Rouck T et al 2009[11] reported a prevalence of the triangular tooth shape in the females. However, this finding in the present study was in contrast.

No significant differences found among the three groups in term of age of study participants (p = 0.912), in contrast to the findings reported by Vandana KL & Savitha B (2005)[12].This could be the result of the wider age range considered in the latter study (i.e. 16–39 years, as opposed to 18-30 years in the present study).

There were also significant difference among the three groups in the CS (p =0.001); H (p=0.002); W of the crown (p=0.033) in contrast to the findings reported by Stellini E et al (2013)[13]. This could be a result of the inclusion of nearly equal number of sample of each tooth shape in contrast to previous study.

Significant differences were found in patient related factors like GT (p = 0.001); and mean Ph(p =0.001) were similar to the findings reported by Stellini E et al (2013)[13].

CONCLUSION:

Hence, it was concluded that different tooth shapes are associated with significantly different values for its gingival thickness, with the height of the interproximal maxillary central papilla, contact surface length; height of the crown; and width of the crown.

Further studies need to be conducted with larger sample size and wider age range groups.

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