Gender Based Comparison of Gingival Zenith Esthetics

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ABSTRACT

Background

The size, proportion and gingival zenith position of maxillary anterior teeth plays in the anterior teeth esthetics.

Objective

To compare the gingival zenith positions and levels between male and female in right and left side as an esthetic parameter.

Method

Impression of the maxillary arch was made in each participant with irreversible hydrocolloid, and dental cast was made with dental stone type IV. Two clinical parameters were evaluated: (1) the gingival zenith position (GZP) from the vertical bisected midline along the long axis of each individual maxillary anterior tooth; and (2) the gingival zenith level (GZL) of the lateral incisors in an apical-coronal direction relative to the gingival line joining the tangents of the GZP of the adjacent central incisor and canine teeth under healthy conditions. Statistical analyses were conducted using SPSS with the level of significance (α) = 0.05. Descriptive statistics was done and Independent t-test was used to compare the GZP and GZL between male and female.

Result

In male, the gingival zenith position for right side central, lateral and canine were 1.05 mm, 0.57 mm and 0.14 mm, and in left side were 1.02 mm, 0.53 mm, 0.15 mm. In female, the gingival zenith position for right side central, lateral and canine were 0.99 mm, 0.48 mm and 0.15 mm, and in left side were 0.94 mm, 0.44 mm and 0.14 mm. The gingival zenith position was significantly different between male and female for both lateral incisors. In addition, significantly different was found for the lateral incisor between right and left side. In male, the gingival zenith level of right and left lateral incisors 0.74 mm and 0.71 mm. In female, the gingival zenith level of right and left lateral incisors 0.76 mm and 0.72 mm. No significant difference was found between male and female for the gingival zenith level of right and left lateral incisors.

Conclusion

The GZP and GZL obtained from this study can be clinically applied to reestablish the GZP of the maxillary anterior teeth during periodontal surgery; crown lengthening or root coverage procedures.

KEY WORDS

Esthetics, gingiva, maxilla, zenith

INTRODUCTION

Beauty has been defined as a combination of features that give pleasure to the mind.[1] The facial standards together with the perception of beauty associated with a sense of social acceptance.[2] Beauty is not an exact science but there is a specific proportion system that includes face and teeth height, width and symmetry. The beauty of the person's face is determined by the harmony of proportions and symmetry.

Dental esthetics is a major consideration for patients seeking a restorative treatment. Anterior teeth proportion plays an important role in restoring the esthetics in patients.[3] Gingival health is among the first fundamental esthetic objectives during treatment planning.[4] For optimal esthetic result, gingival morphology, line and contour play an important role. The gingival zenith position and level form the gingival esthetics. The gingival zenith (GZ) is the most apical aspect of free gingival margin. Gingival line (GZL) is defined as the line joining the tangents of the gingival zeniths of the central incisor and canine.[5] The gingival zenith position (GZP) is located from the vertical bisected midline (VBM) axis of each individual maxillary anterior tooth.[6] During esthetic procedures like crown lengthening, implant, restorative, and orthodontic therapy, gingival line and zenith should be taken into consideration.

A study done by Charruel et al. showed that the GZP of the canine is apical to that of the incisors, and the gingival zenith level (GZL) of the lateral incisor is below 81.1% or on 15% of the gingival lines from the frontal view.[7] The mean apical-coronal position of the lateral incisor GZL relative to the adjacent GZP was 0.68 ± 0.52 mm from the frontal perspective. Chu et al. found all central incisors displayed a distal GZP from the vertical bisected midline (VBM), with a mean average of 1 mm.[6] Lateral incisors showed a deviation of the gingival zenith by a mean of 0.4 mm. In 97.5% of the canine population, the GZP was centralized along the long axis of the canine. The mean distance of the contour of the gingival margin in an apicalcoronal direction of the lateral incisors (GZL) relative to gingival line joining the tangent of the adjacent central and canine GZPs was approximately 1 mm.

No research has been conducted to compare the gingival zenith positions and levels between male and female. The purpose of this investigation was thus to evaluate and compare the gingival zenith positions and levels between male and female. In this study two clinical parameters are measured and compared; the GZP from the VBM axis of each individual maxillary anterior tooth, and the GZL (in an apicalcoronal direction) of the lateral incisors relative to the gingival line joining the tangents of the gingival zenith of the adjacent central and canine under healthy conditions.

METHODS

A total of 51 medical students (19 males and 32 females) from Kathmandu University School of medical Sciences, Dhulikhel within the age group of 20 to 25 years participated in this cross-sectional study. The inclusion criteria were subject willing to participate in the study; complete maxillary anterior teeth; non restored maxillary anterior teeth; no anterior crowding or spacing; no signs of excessive incisal attrition; and no gingival recession, gingival overgrowth, or altered passive eruption. Subjects with missing or artificial prosthesis, restored anterior teeth, presence of spacing between the teeth, crowding and preexisting periodontal disease like gingival recession, gingival overgrowth were excluded from this study. All participants were requested to sign an informed consent document before participating.

Figure 1. Marking of midline (right central incisor) using digital caliper.

Impressions of the maxillary arch were taken from each participant with irreversible hydrocolloid (Jeltrate, Dentsply, PA, USA) using stock tray (Impression Trays, Dentaurum, Germany) and dental cast was made with dental stone type IV (Vel-Mix stone, Kerr Co., CA, USA) manipulated according to the manufacturer instructions. Two clinical parameters were evaluated from the dental cast: (1) the gingival zenith position (GZP) and gingival zenith level (GZL). At first, tooth width were measured at two reference points; the proximal incisal contact area position (ICAP) and the apical contact area (ACAP) position. Each width was divided in half, and the center points were marked [Figure 1]. Center points were extended to a line toward the gingival aspect of the clinical crown to define the vertical bisected midline (VBM).[6] The highest point of the free gingival margin was marked and measured from the vertical bisected midline (VBM) along the long axis of the tooth of the maxillary anterior dentition, including the central incisors, lateral incisors, and canine teeth, to obtain the gingival zenith position (GZP) in a medial-lateral direction [Figure 2].

Figure 2. Measurement of the GZP (right central incisor) using digital caliper.

To measure the gingival zenith position (GZL), a gingival line (i.e., a line joining the tangents of the gingival zeniths of the central incisor and canine) joining maxillary centrals to the canines was drawn. The distance of the contour of the gingival margin for the lateral incisor was measured from the line to obtain the GZL in an apical-coronal direction of the lateral incisors relative to the adjacent central and canine gingival zenith points [Figure 3].

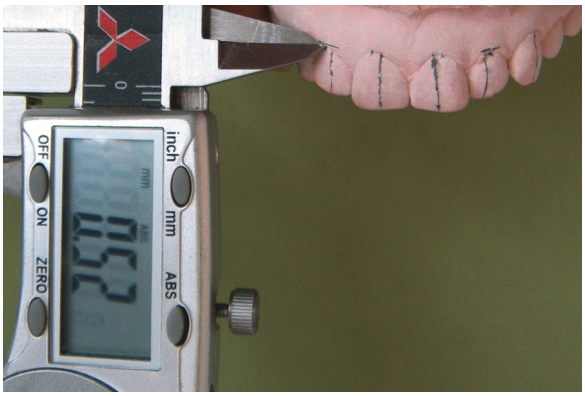

Figure 3. Measurement of the GZL (right lateral incisor) using digital caliper.

All measurements were made by one investigator. Each measurement was measured three times and the mean value was calculated. Statistical analyses were conducted using Statistical PASW® Statistics 18.0 (SPSS, Chicago, IL, USA) with the level of significance (α) = 0.05. Descriptive statistics was done and Independent t-test was used to compare the GZP and GZL between male and female.

RESULTS

A. Results of gingival zenith position:

The results of gingival zenith position of maxillary anterior teeth in total population is shown in Table 1.

The results of comparison of gingival zenith position of maxillary anterior teeth between right and left side in total population is shown in Table 2. Significant difference was found only for the gingival zenith position of lateral incisor between right and left side.

Table 1. Results of gingival zenith position in total Nepalese population. (N=51)

Tooth	Mean ±SD	Min	Max
Right Central Incisor	1.02 ±0.20	.32	1.50
Right Lateral Incisor	0.51 ±6.22	.22	.75
Right Canine	0.15 ±0.07	.01	.31
Left Central Incisor	0.97 ±0.15	.50	1.33
Left Lateral Incisor	0.47 ±0.11	.24	.70
Left Canine	0.14 ±0.11	.01	.62

Table 2. Results of comparison of gingival zenith position between right and left in total Nepalese population.

Tooth	Right side	Left side	P-value
	Mean ± SD	Mean ± SD	
Central Incisor	1.02 ± 0.20	0.97 ± 0.15	1.03
Lateral Incisor	0.51 ± 6.22	0.47 ± 0.11	0.01*
Canine	0.15 ± 0.07	0.14 ± 0.11	0.90

*Significant difference at the 0.05 level (two-tailed)

The results of comparison of comparison of gingival zenith position of maxillary anterior teeth between male and female is shown in Table 3. Significant difference was found for the gingival zenith position of right and left lateral incisor between male and female.

Table 3. Results of comparison of gingival zenith position between male and female in total Nepalese population.

Tooth	Male (N=19)	Female (N=32)	P-value
	Mean ±SD	Mean ±SD	
Right Central Incisor	1.05 ±0.23	0.99 ±0.19	0.31
Right Lateral Incisor	0.57 ±0.11	0.48 ±0.12	0.02*
Right Canine	0.14 ±0.85	0.15 ±0.05	0.88
Left Central Incisor	1.02 ±0.09	0.94 ±0.18	0.07
Left Lateral Incisor	0.53 ±0.09	0.44 ±0.11	<0.01*
Left Canine	0.15 ±0.11	0.14 ±0.11	0.96

*Significant difference at the 0.05 level (two-tailed)

B. Results of gingival zenith level:

The result of gingival zenith level in total population is shown in Table 4.

Table 4. Results of gingival zenith level in total Nepalese population

Tooth	N	Mean ±SD	Min	Max
Right Lateral Incisor	51	0.76 ±0.28	0.23	1.21
Left Lateral Incisor	51	0.72 ±0.26	0.14	1.15

The results of comparison of gingival zenith level of lateral incisor between right and left in total population is shown in Table 5. No significant difference was found for the gingival zenith level of lateral incisor between right and left side.

Table 5. Results of comparison of gingival zenith level of lateral incisor between right and left in total Nepalese population.

Tooth	Right side	Left side	P-value
	Mean ±SD	Mean ±SD	
Lateral Incisor	0.76 ±0.28	0.72 ±0.26	0.18

The results of comparison of gingival zenith level of right and left lateral incisor between male and female is shown in Table 6. No significant difference was found for the gingival zenith level of right and left lateral incisor between male and female.

Table 6. Results of comparison of gingival zenith level between male and female in total Nepalese population.

Tooth	Male (N=19)	Female (N=32)	P-value
	Mean ±SD	Mean ±SD	
Right Lateral Incisor	0.74 ±0.31	0.76 ±0.26	0.78
Left lateral Incisor	0.71 ±0.26	0.72 ±0.26	0.85

DISCUSSION

The zenith is defined as the most apical point of the gingival marginal scallop.[5] GZP of the maxillary anterior teeth and GZL of the lateral incisor relative to the central incisors and canine teeth can significantly influence the esthetic appearance of a smile.[6] Knowing the GZP of each maxillary anterior tooth from the VBM as well as the GZL of the lateral incisors can help facilitate a reference point during esthetic periodontal plastic surgery procedures.

Our study shows the average GZP of 1.02±0.20 mm for central incisor, 0.51±6.22 for lateral incisior and 0.15 ±0.07 for canine, which is in consistent with the finding of Shah et al who evaluated the position of gingival zenith relative to the midline in maxillary anterior teeth in attractive smiles in 240 sites in 20 subjects.[8] The VBM of the six anterior teeth were marked on diagnostic casts. The GZP for each tooth was then marked on the same casts. This study demonstrated that all central incisors displayed a distal GZP from the VBM, with a mean average of 0.9 mm. Lateral incisors showed a deviation of the gingival zenith by a mean of 0.5 mm. For canines, the mean distal deviation was 0.3 mm.

On comparing the gingival zenith position between the male and female our study does not show any significant difference on the right central incisior (p= 0.31), left central incisor (P= 0.07), right canine (p= 0.88) and left canine (p= 0.96). However there was significant difference between the GZP of the two genders on right and left lateral incisiors (p= 0.02 and <0.01 respectively). None of the published literatures found which compare the GZP among the genders.

Zagar et al. studied the distal displacement of the gingival zenith in relation to the long axis of the crowns in the maxillary anterior dentition.[9] Measurements were taken with a digital caliper in maxillary stone casts of six maxillary anterior teeth. The gingival zenith was distally displaced between 0.45 and 1.01 mm in 90%, 85% and 60% of the central incisors, lateral incisors and canines, respectively. Contralateral comparisons between the tooth groups revealed significantly larger distal displacement of the zenith in left canine ($p<0.05$). Ipsilateral comparisons revealed that the lateral displacement of the zenith was significantly larger in central than in lateral incisors ($p<0.05$). Similarly, the zenith of lateral incisors was displaced significantly more distal than that of canine teeth ($p<0.05$). So, the frequency and magnitude of distal displacement is tooth-dependent and larger in central than in lateral incisors, which in turn, is larger than in canines. Comparisons of the frequency of coincidence of the position of the gingival zenith with the long axis of the tooth revealed that it was significantly greater in canines than in lateral and central incisors. Similar results were found in this present study, the magnitude of distal displacement was larger in central than in lateral incisors, which in turn, is larger than in canines. The gingival zenith position in male for right side central, lateral and canine were 1.05 mm, 0.57 mm and 0.14 mm, and in left side were 1.02 mm, 0.53 mm, 0.15 mm. In female, the gingival zenith position for right side central, lateral and canine were 0.99 mm, 0.48 mm and 0.15 mm, and in left side were 0.94 mm, 0.44 mm and 0.14 mm. (Table 3)

A study done by Charruel et al. showed the mean apical-coronal position of the lateral incisor GZL relative to the adjacent GZP was 0.68±0.52 mm from the frontal perspective.[7] In this present study, in males, the GZL of right and left lateral incisors were 0.74 mm and 0.71 mm respectively. In females, the GZL of right and left lateral incisors 0.76 mm and 0.72 mm. No significant difference was found between male and female for the GZL of right and left lateral incisors. Chu et al. found all central incisors displayed a distal GZP from the vertical bisected midline (VBM), with a mean average of 1 mm.[6] Lateral incisors showed a deviation of the gingival zenith by a mean of 0.4 mm.

Regarding the right and left side, the results from this study shows no significant difference for the gingival zenith level of lateral incisor between right and left side (Table 5). But in nature, right and left differences are present everywhere where two congruent but mirror images types are present. In contrary to our finding, a study done by Burkey shows the asymmetrical gingival contours in right and left side.[10]

CONCLUSION

The GZP and GZL obtained from this study can be clinically applied to reestablish the GZP of the maxillary anterior teeth during periodontal surgery; crown lengthening or root coverage procedures.

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