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Research Article

QUANTITATIVE EVALUATION OF DEVIATION OF GINGIVAL ZENITH POSITION IN MAXILLARY ANTERIOR DENTITION

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ABSTRACT

Context: Zenith points are the most apical position of the cervical tooth margin where the gingiva is most scalloped. To establish the appropriate gingival zenith is of utmost importance in the field of esthetic dentistry. Any alterations in symmetry and gingival contour can significantly have impact on harmony of both natural and artificial teeth.

Aims: To measure the deviation of Gingival zenith (GZ) of maxillary anterior with the Vertical Bisected Midline (VBM) and Apico coronal displacement of lateral incisor zenith from Gingival Zenith Level (GZL) of central incisor and canine

Settings and Design: 50 patient was enrolled in our study who satisfy the inclusion and exclusion criteria. Six maxillary anterior teeth was assessed for each subject and hence the total sample size was 300 teeth.

Methods and Material: For each subject alginate impression was taken and a diagnostic cast was made. Gingival zenith was marked for the six maxillary anterior teeth using method as done by Chu and Stappert. The deviation of gingival zenith point was measured from gingival zenith level and vertical bisected midline of each tooth. The data was tabulated and subjected to statistical analysis.

Statistical analysis used: The descriptive analysis was carried out. Mean and percentages were used to evaluate the deviation of gingival zenith

Results: Gingival zenith deviation was greater in Central Incisor 1.243 ± 0.297 mm and least in Canine 0.028 ± 0.114 mm. The mean apico-coronal displacement of gingival zenith of Lateral incisor was 1.024 ± 425 mm from gingival zenith level

Conclusion: Gingival zenith deviation is tooth dependent and distal to long axis

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INTRODUCTION

The gingival zenith is of prime importance in case of cosmetic dentistry. The overall aesthetic matters but the gingival tissue contours and forms also plays a major role in defining aesthetic smile. Any dental procedure planned in this region can lead to an esthetic challenge because of the dentogingival interface visibility¹. The physiologic gingival contour has been defined as "one in which the interdental area is conical and coronally positioned to the buccal and lingual (or palatal) plates of bone, which have a parabolic shape and flow smoothly from the interdental area; that follows the shape of the cemento-enamel junction,"² "allowing a thin, scalloped, knife-edged gingival contour with pyramid-shaped papillae that fill the interproximal space."³ This knife-edged, festooned marginal gingival contour

is primarily affected by the degree of concavity and convexity of the tooth surface.⁴

Locating gingival zenith points is a critical step in changing the mesial and distal dimensions, for the purpose of either closure of diastema. It is required to alter the position of the gingival zenith points to obtain the illusion of bodily movement and hence reduce exaggerated triangular form. It is also helpful in correction of tooth angulation.⁵ The aim of the study was to measure the deviation of Gingival zenith (GZ) of maxillary anterior with the Vertical Bisected Midline (VBM). We have also measured the Gingival zenith distance (Apicocoronally) of lateral incisor from Gingival Zenith Level (GZL) of central incisor and canine.

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Subjects and Methods

The study was conducted after the approval from the Scientific Review Committee and the Institutional Ethical Committee of Dental College and Hospital, Navi Mumbai. 50 periodontally healthy subjects were included in the study on the basis of inclusion and exclusion criteria. These subjects were chosen from O.P.D. patients of dental college. The inclusion criteria were subjects of 18 years and above; having all maxillary anteriors present. The exclusion criteria were subjects having crown restoration and prosthesis in maxillary anterior teeth and those receiving medication with any known effect on periodontal soft tissue and those undergoing orthodontic treatment and any history of any periodontal surgery in maxillary anterior teeth.

Alginate impression were made and poured with stone and a diagnostic cast was obtained. On each cast vertically bisected midline, gingival zenith point and gingival zenith level was marked. All the measurement was done by using a digital caliper with a display. The method to mark the gingival zenith was given by Chu *et al* in 2009⁶. Vertically bisected midline was marked for each tooth from canine to canine. The mesio-distal width of the tooth was measured at two reference points. The proximal incisal contact area position (ICAP) and the apical contact area position (ACAP) was kept as reference points. Both the width was divided into half, and the center point for each was marked.(fig: 1) Center points were further extended to obtain a linetoward the gingival contour of crown to locate the vertical bisected midline (VBM). (fig: 2)

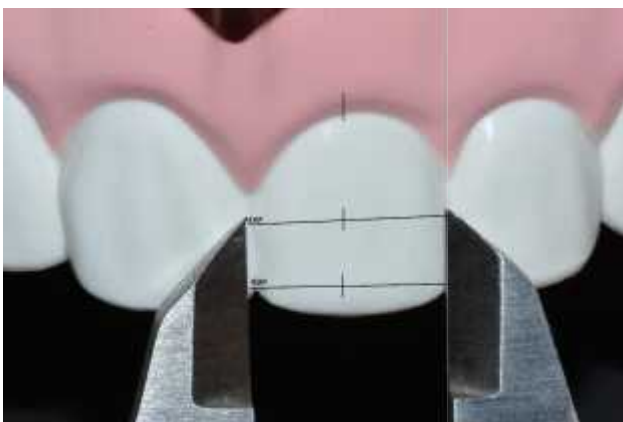


Fig1 Proximal Incisal Contact Area Position (ICAP) and the Apical Contact Area Position (ACAP)

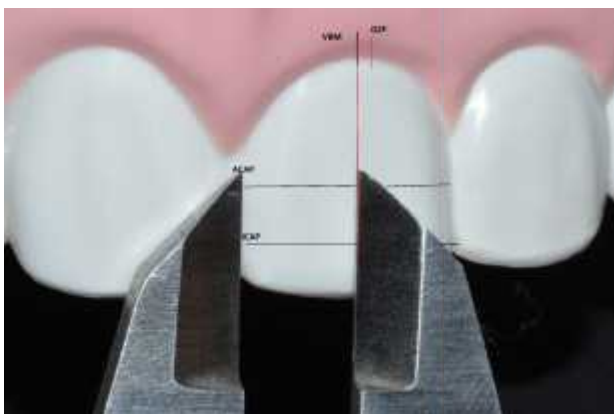
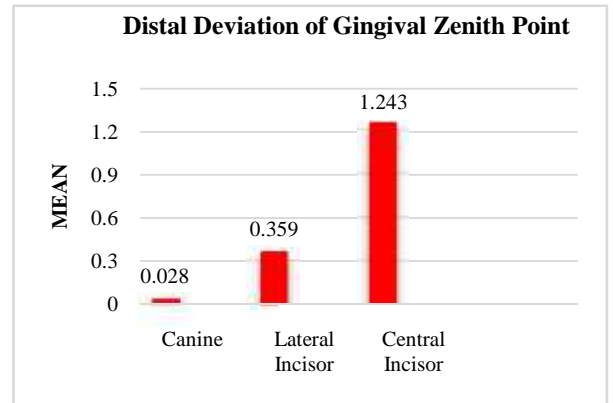
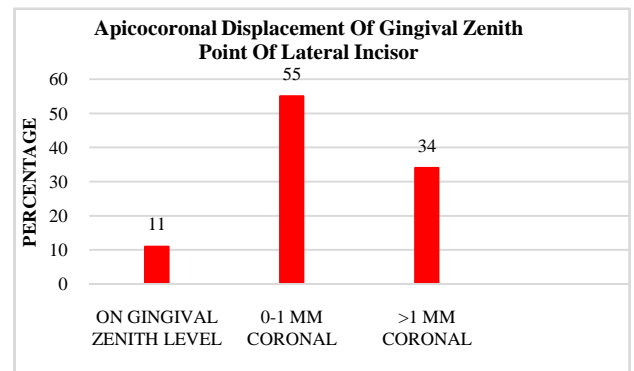


Fig 2 Vertical Bisected Midline (VBM) was marked by extending the mid point.



Graph no. 1 Mean distal deviation of gingival zenith point of each tooth types



Graph No 2 Mean Apicoronal displacement of gingival zenith of lateral incisors

The highest point of the gingival contour for each tooth was marked. This point gives the gingival zenith point (GZP) (fig: 3). The distance of the highest gingival margin position to the vertical bisected midline (VBM) was measured with a digital caliper along the VBM of each tooth, including the central incisors, lateral incisors, and canine teeth. (fig :4)

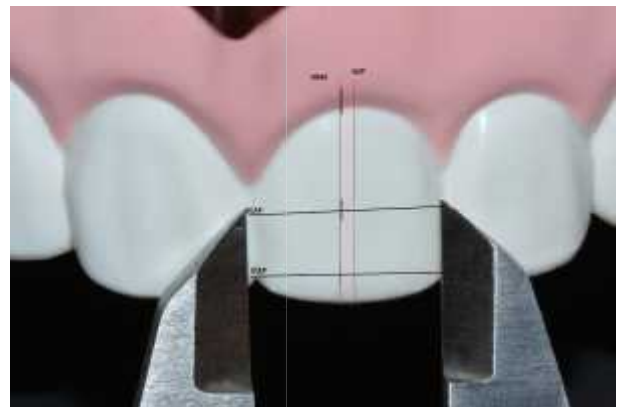


Fig 3 Highest point of the gingival contour for each tooth was marked; Gingival Zenith Point (GZP)

A gingival line (tangent) was drawn by joining the gingival zenith point of maxillary centrals to the canines. The distance of the gingival zenith point of lateral incisor was measured from the line to obtain the gingival zenith level (GZL) in an apical-coronal direction. This gingival zenith level was then compared with the gingival zenith level of central incisor and canine. (fig:5)

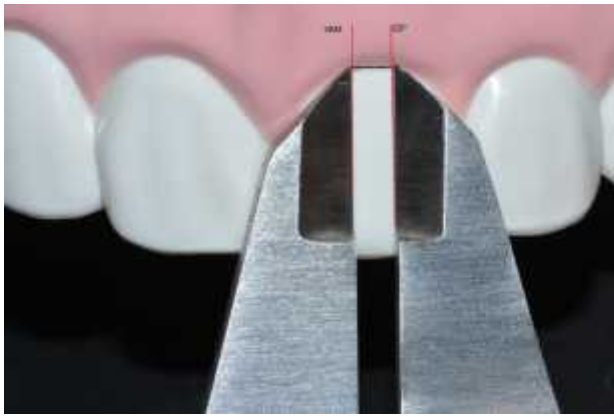


Fig 4 Distance between GZP and VBM was measured



Fig 5 Gingival Zenith Level (GZL) of lateral was compared with GZL of central incisor and canine

All the measurement was done on both the sides and the data was tabulated.

Table no 1 Mean deviation and percentage of deviation of gingival zenith of each tooth types

Deviation	Canine	Lateral Incisor	Central Incisor	Apicocoronal Displacement
Mean ± S.D.	0.028±0.114	0.359±0.324	1.243±0.297	1.024±425
%age	6	60	100	89

RESULTS

50 cast were evaluated for deviation of gingival zenith of all the maxillary anterior teeth. In all the cases distal deviation of gingival zenith from the vertical bisected midline was found.

Deviation of gingival zenith point from vertical bisected midline of canine

In case of canine we found that in 94 % of cases the gingival zenith coincides with vertical bisected midline. The mean distal deviation was 0.028±0.114mm with a range of 0.0-0.61 mm in 6 % of cases. (Graph: 1, Table no:1)

Deviation of gingival zenith point from vertical bisected midline of Lateral Incisor

In case of lateral Incisor we found that in 40 % of cases the gingival zenith coincides with vertical bisected midline. The mean distal deviation was 0.359±0.324mm with a range of 0.0-0.90 mm in 60 % of cases. (Graph: 1, Table no:1)

Deviation of gingival zenith point from vertical bisected midline of Central Incisor

In case of Central Incisor we found that in 0 % of cases the gingival zenith coincides with vertical bisected midline. The mean distal deviation was 1.243±0.297mm with a range of 0.83-1.88 mm in 100% of cases.(Graph: 1, Table no:1)

Apicocoronal displacement of Lateral Incisor zenith from the gingival zenith level (GZL)

It was found that majority of cases (89%) showed coronal displacement of gingival zenith from the gingival zenith level of canine and central incisor teeth. The mean apicocoronal deviation was 1.024±425mm with a range of 0.0-1.80 mm.

We also observed that around 11 % of cases gingival zenith coincides with the gingival zenith level. Whereas in 55 % of cases it was deviated in range from 0-1mm. and in 34% of cases it was deviated more than 1 mm from the gingival zenith level. (Graph no:2, Table no:1)

DISCUSSION

Healthy gingiva is amongst the prime requirement during esthetic treatment planning and it is important to consider its morphology and contour⁷. To provide a more satisfactory esthetic results in a complete rehabilitation involving interdisciplinary intervention; one needs to be very specific about the dentogingival interface. Gingival zenith being an important feature in gingival morphology; can lead to a negative smile effect if there is any discrepancy in gingival zenith position.⁸

In our study we have used Chu and Stappert method to locate gingival zenith position and vertical bisector midline. In most of the studies proper definition of gingival zenith point was lacking. Hence there was lots of confliction about the location of gingival zenith point. The reason why gingival zenith point location becomes important is that it determines the axial inclination of the tooth.

We observed that in 100 % of cases the central incisor zenith was deviated distally from the vertical bisected midline. In case of canine we found 94% coincidence with the midline and lateral incisor remain in midway with 40% cases coinciding with VBM. Magne and Bellser in 2002 observed a distal deviation of gingival zenith in all the maxillary anterior teeth.⁷ Later in 2008 Carolina *et al* with a sample of 50 healthy individuals marked gingival zenith as highest scalloped gingiva and a perpendicular bisector to gingival zenith level as vertical bisected midline. He concluded that more anterior the tooth, greater the prevalence and distal displacement of gingival zenith. According to their observation lateral displacement was greatest in central incisor then lateral incisor and least in canine⁹. Our results also state the similar findings (deviation in CI= 1.243±0.297, LI= 0.359±0.324, C= 0.028±0.114)

Stein in 1977¹⁰ and Kay in 1982¹¹ have also stated that gingival zenith of incisors teeth lies distal to their long axis. In 2000 Rufenacht found out that only in central incisor and canine the gingival zenith deviated distal to long axis¹². Later in 2003 Goodlin also observed that gingival zenith lies at distal third in case of central incisor, at the VBN for lateral incisor and in canine it lies between anterior third to distal third of the crown¹³.

A vast undefined population was being observed in these studies, and no description of the method used for data acquisition and interpretation which accounts for variability in the findings.

While considering the zenith of lateral incisor in relation to gingival zenith level, we have found that gingival zenith of lateral incisor were coronal to gingival zenith level in 89% cases. We observed that apico-coronal displacement was 1.024 ± 0.425 mm in range from 0-1.8 mm. Carolina et al in 2008 observed that 70% of population presented the gingival zenith of lateral incisor positioned coronal to gingival zenith level of central incisor and canine⁹. The apico-coronal displacement was 0.75 ± 0.60 mm and ranges from 0.4-2.6 mm⁹. In most of the studies the apico-coronal displacement ranges from 0.5-2 mm coronal to gingival zenith level. In our study we have observed that 11 % of population had lateral incisor zenith on the gingival zenith level of central incisor and canine; whereas 55% cases had coronal displacement but <1 mm. 34% of population presented >1 mm of coronal displacement of lateral incisor zenith from the gingival zenith level. In 2011 Pawar et al observed similar result in a sample of 35 subjects; 17.1% , 48.6% and 27.1% of population presented lateral incisor zenith on the gingival zenith level, <1 mm and >1 mm respectively¹⁴.

CONCLUSION

We have found that gingival zenith displacement is tooth dependent. The distal displacement was greater in central incisor and least in canine. We also observed that in majority of cases gingival zenith of canine coincides with vertical bisected midline. In majority of cases there was coronal displacement of gingival zenith of Lateral incisor in relation to zenith of central incisor and canine which ranges from 0 to 1 mm.

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