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Original Research

The collum angle of Maxillary Central Incisors in different types of malocclusions in weastern Nepal – A Cephalometric study

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ABSTRACT:
Tooth morphology is important to achieve aesthetic, functional and optimal occlusion of teeth. Collum angle plays an important role for the attainment of these obvious objectives of the orthodontic treatment . The angulation of the root to the crown, particularly of the single rooted anterior teeth is known as Collum angle. In other words angle formed by the intersection of the long axis of the crown and root and it is measured using the lateral cephalogram. This angle may limits the tooth movements of incisors specially when it is torque lingually because of the lingual cortical very near to the roots of central incisors. The extent of recession is related to the bending angle. Gingival recession due to improper movement of tooth during orthodontic treatment may lead to cosmetic defects. Therefore, understanding the crown-root angle in patients with different types of malocclusion is a critical issue. The present study was done to assess the collum angle in population of western Nepal.

Keywords: Collum angle, root, angle, cephalogram

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INTRODUCTION

In a cephalogram a line drawn from the root apex to incisal edges may not pass through the centre of the tooth at the cementoenamel junction.(1)There is "bent" between root and crown. [2]. This anatomic variation may affect either the treatment or the retention phase of orthodontic treatment. Deviant root angulations when move vertical or horizontal direction may cause the root to encroach on the labial or lingual cortical plate. [1].

In a study by Delivanis and Kuftinec," it was found that in Class II, Division 2 patients the crowns of the maxillary central incisors tended to be "bent" to the lingual more often than in patients with other types of malocclusion [3] This tendency has long been noted by orthodontists and was even postulated by Backlund [4] to be a contributing factor in the development of Class II, Division 2 malocclusions. It has been suggested by Delivanis and Kuftine that the crown-root angulation described as occurring in Class II, Division 2 malocclusions may complicate orthodontic intrusion and torque of the incisors and, in severe cases, may increase the danger of perforating the palatal cortical plate [3]

Previous studies indicated that the Collum angle differs among groups with different types of malocclusion. To the present, no related research reports (research on the crown-root angle or Collum angle) regarding western Nepalese. The aim of this study was therefore to determine the Collum angle of the maxillary central incisors in western Nepali population with different types of malocclusion using lateral cephalogram.

MATERIALS AND METHODOLOGY

The present retrospective quantitative study was done in the department of Orthodontics and dentofacial ortthopaedics, UCDS college of dental surgery, Bhairahawa Nepal. Ethical clearance was taken on 1st week of October 2021 (UCMS/IRC/157/21) For this consents of all the patients was also taken. The study included lateral cephalograms of 60 patients, including 29 male and 31 female patients which was collected from the departmental radiographic records during October 2021 to January 2022 and data analysis was done within one month. The sample was include lateral cephalograms of Nepalese citizen of Province 5 meeting the inclusion criteria of having Angle's class II div 1, class II div 2 and class III malocclusions visiting the department of orthodontics and dentofacial orthopedics, UCMS College of Dental Surgery upon which analysis was done regarding Collum angle. Being one of the tertiary centers in this province patients coming from different districts of province no. 5, it was relatively easier and less time consuming to collect the required number of samples for the study. The orthodontists categorized patients into three groups according to the malocclusion type using Angle's classification of malocclusion as:, Class-II division-I, Class-II division 2, and Class-III malocclusions. In order to clearly measure the Collum angle of the maxillary central incisors on lateral cephalometric radiographs of all patients, researchers had to be able to identify the natural tooth axis of the maxillary central incisors; therefore, no prostheses (posts, dental implants, or fixed partial dentures) could be present in the anterior zone. Additionally, lateral cephalometric radiographs showing patients who underwent previous orthodontic treatment or maxillofacial surgery, patients with craniofacial syndromes or had a history of facial trauma, patients with missing incisor and severe crowding or mixed dentition in the anterior zone were excluded from the analysis.

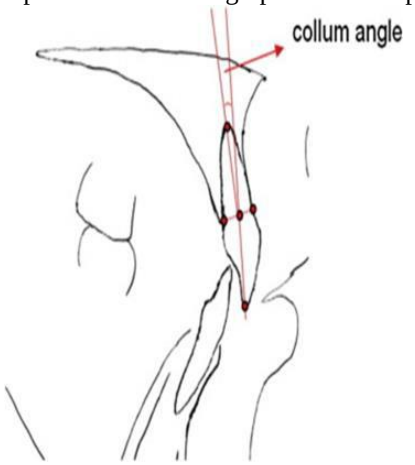

Fig 1: Measurement of collum angle

Gender	Noof samples	%of samples
Male	29	45%
Female	31	55%
Total	60	100%

Table -1

Measurement of Collum angle

After sketching the maxillary central incisor type from the lateral cephalometric radiographs, the superius point of the incisal edge and the middle point of the cementoenamel junction were joined to depict the crown axis, and then the middle point of the cementoenamel junction with the root apex to depict the longitudinal axis were joined. The Collum angle was then measured. (Fig 1)

Based on lateral cephalograms and dental casts (for dental classification), the patients were categorized into three equal-sized groups, class II division 1 ,class II division 2 and class III. It is then subjected to statistical analysis using ANOVA and Tukeys multiple post-hoc (table -2)

Dental malocclusion	Mean	Std.Dev.
Class II Div 1	6.12	5.21
Class II Div 2	12.00	6.67
Class III	5.28	5.34
Total	6.20	5.35
F-value	11.4368	
p-value	0.00001*	
Pair wise comparison by Tukeys multiple posthoc procedures		
Class II Div 1 vs Class II Div 2	P=0.00001*	
Class II Div 1 vs Class III	P=0.6520	
Class II Div 2 vs Class III	P=0.00001	

Table -2

DISCUSSION

The results of the present study indicate that there is a wide variation in the shapes and forms of maxillary central incisors within the general population. Although these variations have been noted by orthodontists, there have been relatively few comprehensive studies to quantify them. This study found that the crown-root shape of the permanent maxillary central incisor in Class II division 2 malocclusions differs, Class II division 1, and Class III malocclusions. The crown-root shape of the maxillary central incisor, however, was not significantly different among the Class II division 1 class II division 2, and Class III malocclusion groups.3 The shape characteristics of the Class II division 2 permanent maxillary central incisor involved axial bending and a reduced labiopalatal thickness. This is in accordance with previous studies. Furthermore, a shorter root and a longer crown were also identified as important characteristics of the Class II division 2 permanent maxillary central incisor. No previous cephalometric study has investigated this crown-root relationship among all the incisal classes. This parameter could prove to be important in the etiology and management of Class II division 2 malocclusions. No significant incisor shape difference was found between our Class III group and any of the other malocclusion groups. This conflicts with the findings of Harris *et al.* [6] Despite excluding Class II division 2 cases from their sample, they detected a difference in the crown-root angulation of Class III maxillary central incisors in comparison with Class I and Class II division 1 incisor relationships.

The maxillary central incisor crowns of Class II, Division 2 patients were found to be “bent” lingually in relation to their roots. This abnormal configuration has been suggested as a contributing factor in the development of the deep bite seen in Class II, Division 2 patients. Whether the “bending” of the crown on the root is genetically determined or occurs because of physical factors during tooth development is unknown and may be a difficult question to answer. In either case, the extreme retroclination of the central incisor crowns is evidently due not only to improper positioning of the tooth within the maxilla but also to an abnormal crown-root angulation. This fact may possibly cause complications in the treatment of Class II, Division2 patients. In the event of severe crown-root angulation, one must consider the possibility of impingement of the root on palatal cortical bone when torqueing in a palatal direction. While some may claim that it is the position of the crown and not of the root that is important, it may be advisable to evaluate more closely the position of the central incisor roots and also the anatomic form of the surrounding bone in Class II, Division 2 patients. The conclusions drawn from cephalometric evaluations of central incisor position need to be carefully scrutinized in these patients exhibiting teeth with crown-root angulation variations. Anatomic variation in tooth and/or palatal morphology needs to be taken into account.

CONCLUSION

Based on the cephalometric study done to assess the collum angle in various malocclusions showed that the Collum angle between the crown axis and root axis in maxillary central incisors, the class-II division-2 malocclusion group showed a significantly greater Collum angle as compared to the other malocclusion.

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