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Gingival thicknesses of maxillary and mandibular anterior regions in subjects with different craniofacial morphologies

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Introduction: The aim of this study was to evaluate the mean gingival thicknesses of the maxillary and mandibular anterior regions in subjects with different craniofacial morphologies. **Methods:** For each dental arch, 128 periodontally healthy orthodontic patients with normal values of maxillary incisor position (1/NA, angle and distance; and 1/SN, angle) and mandibular incisor position (1/NB, angle and distance; and IMPA) were enrolled in the study. Craniofacial morphology of the participants was evaluated in the sagittal (ANB angle) and vertical directions (SN/GoGn angle) on lateral cephalograms. In the sagittal direction, the subjects were divided into 3 groups as Class I, Class II, and Class III. Each group was classified as low angle, normal, or high angle in the vertical direction. Mean gingival thicknesses of the maxillary and mandibular anterior regions were determined by the ratio of the sum of gingival thickness of the relevant teeth, measured by the transgingival probing technique, to the number of teeth. **Results:** Mean gingival thicknesses of the maxillary anterior region were 1.173 ± 0.61, 1.103 ± 0.207, and 1.130 ± 0.244 mm in the Class I, Class II, and Class III groups and 1.084 ± 0.150, 1.136 ± 0.247, and 1.159 ± 0.249 mm in the low angle, normal, and high angle groups, respectively. Mean gingival thicknesses of the mandibular anterior region were 0.710 ± 0.156, 0.741 ± 0.176, and 0.691 ± 0.157 mm in the Class I, Class II, and Class III groups and 0.705 ± 0.184, 0.701 ± 0.132, and 0.735 ± 0.174 mm in the low angle, normal, and high angle groups, respectively. No significant difference was found between the groups in terms of the mean gingival thicknesses of the maxillary and mandibular anterior regions. **Conclusions:** There was no significant difference between the groups in terms of the mean gingival thicknesses of the maxillary and mandibular anterior regions. (Am J Orthod Dentofacial Orthop 2018;154:356-64)

Gingival phenotype is a term used to define the buccolingual thickness of the gingiva. Gingival thickness, determined by the shape and size of the dental root and the contour of the alveolar bone, is classified as 2 types: thick flat and thin scalloped.[1]

Precise evaluation of thick and thin gingival phenotypes, the response of which may be different to inflammation, parafunctional habits, and trauma, is of critical importance when planning orthodontic treatment.[1,2] A localized gingival infection may cause periodontal problems in the form of pocket formation rather than gingival recession in subjects with a thick gingival phenotype, since it is limited to only part of the gingival sulcus and does not involve the outer layers of the gingival tissue. A similar infection may cover the whole gingival tissue and cause serious periodontal problems such as gingival recession in subjects with a thin gingival phenotype.[2]

Labial gingival recession is defined as the exposure of the root surface due to apical movement of the gingival margin from the cementoenamel border.[2] Despite the unclear pathogenesis of gingival recession, alveolar bone fenestration and dehiscence are among the etiologic factors.[2,3] Another factor that may cause gingival recession is orthodontic tooth movement exceeding the anatomic limits of the alveolar bone by application of uncontrolled forces.[2,4,5] Alveolar bone fenestrations that can result from such dental movements enhance susceptibility to gingival recession, particularly in subjects with the thin gingival phenotype.[4-6]

Many features of gingival phenotype are genetically determined, and others seem to be influenced by age, sex, growth, tooth shape, and tooth position.[7]

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Craniofacial morphology may also affect the gingival phenotype.[7-9] The musculature directly affects the position and structure of the maxilla and the mandible.[10] It has been reported that the cortical bone thicknesses of the maxilla and the mandible are reduced due to decreased muscle function, which in turn affects gingival thickness.[10,11] Although some studies have evaluated the relationship of gingival phenotypes to craniofacial morphology in the vertical direction, no authors have evaluated the association between gingival phenotype and craniofacial morphology in the sagittal direction.[8] The aim of our study was to investigate the relationship of gingival thickness to different craniofacial morphologies. The null hypothesis was that the mean gingival thicknesses of the maxillary and mandibular anterior regions change on the basis of different craniofacial morphologies.

MATERIAL AND METHODS

For each dental arch, 128 subjects were enrolled in this study, all from the Department of Orthodontics, Faculty of Dentistry, at Yüzüncü Yıl University, Van, Turkey, between June 2014 and June 2015. After we provided a description of the study, written and informed consent was obtained from all participants. The study began after approval from the research ethics committee, Faculty of Medicine, of Yüzüncü Yıl University (B.30.2.YYU.0.01.00.00/141).

The exclusion criteria were previous orthodontic treatment, severe anterior crowding (> 6 mm),[12] vestibular or buccally positioned maxillary and mandibular canines, lingual or palatally positioned maxillary and mandibular lateral incisors, dental compensation of anterior teeth, attachment loss, pockets deeper than 4 mm, congenital anomaly, dental structural disorder, crowns or extensive restorations, pregnancy or lactation, systemic problems and related medications that could have an impact on the thickness of gingival tissues, antibiotics taken within the last 6 months, and smoking. Patients with these problems were not included in this study. The inclusion criteria were periodontally healthy subjects with maxillary and mandibular incisor positions and inclinations within normal values (1-NA, angle and distance; 1-SN, angle; 1-NB, angle and distance; and IMPA), mild (0-3 mm) or moderate (3-6 mm)[12] anterior crowding, and complete permanent dentition.

Measurements of the plaque index (Silness and Löe[13]), gingival index (Löe and Silness[14]), and probing depth of the periodontal pockets were taken from the mesial and distal surfaces. Furthermore, this took place from the vestibular midpoint and palatinal midpoint of the subjects' maxillary and mandibular anterior teeth using a periodontal probe (PQW7 Williams; Hu-Friedy, Chicago, Ill).

Subjects' cephalometric measurements were evaluated from lateral cephalometric radiographs taken at the beginning of the orthodontic treatment with a Sirona Orthophos XG imaging system (Bensheim, Germany). Each subject's head was stabilized by positioning the ear rods of the machine in the external auditory meatus with the Frankfort horizontal plane parallel to the horizontal, the sagittal plane at right angles to the path of the x-ray, the teeth in the centric occlusion, and the lips in a closed and relaxed position.[15] The cephalogram images were then imported into the NemoCeph NX 2005 (Nemotec, Madrid, Spain) program and digitally traced by 1 investigator (Y.K.). Landmarks used in the study are shown in Figure 1.

Skeletal angular and linear measurements were as follows: ANB, angle between point A, nasion, and point B; 1-NA, distance between the most labial point on the maxillary incisor to a line from nasion to point A; 1-NA, angle formed by the long axis of the maxillary incisor to a line from nasion to point A; 1-SN, angle formed by the extension of the long axis of the maxillary incisor to the SN plane; 1-NB, distance between the most labial point on the mandibular incisor to a line from nasion to point B; 1-NB, angle formed by the long axis of the mandibular incisor to a line from nasion to point B; IMPA, the long axis of the mandibular incisor measured to the mandibular plane and the most inward angle toward the body of the mandible; and SN/GoGn, angle between the SN plane and mandibular plane (GoGn). Accepted normal values for ANB, 1-NA, 1-NA, 1-SN, 1-NB, 1-NB, IMPA, and SN/GoGn were 2.65° ± 1.63°, 4.82 ± 2.0 mm, 21.47° ± 6.00°, 102.07° ± 9.73°, 4.82 ± 2.00 mm, 27.68° ± 4.97°, 96.50° ± 7.50°, and 31.66° ± 5.25°, respectively.[15]

Craniofacial morphology was evaluated in the sagittal (ANB) and vertical (SN/GoGn) directions. In the sagittal direction, the subjects were divided into 3 groups: skeletal Class I, skeletal Class II, and skeletal Class III. Each sagittal classification group was divided into subgroups in the vertical direction: low angle, normal, and high angle (Fig 1).

The gingival thicknesses of the maxillary and mandibular anterior teeth (canine to canine) were evaluated from 2 regions: apical to the free gingival margin, and coronal to the mucogingival junction. In these regions, the measurements were repeated twice at 10-minute intervals; from the arithmetic mean of these measurements, the gingival thickness of each region was determined. The gingival thickness of each tooth was determined by the arithmetic mean of the gingival thickness values from apical to the free gingival margin, and coronal to the mucogingival junction. The mean gingival thicknesses of the maxillary