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Original article

Assessment of hyoid bone position among different skeletal patterns

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ABSTRACT

Purpose: To determine the hyoid bone position in subjects with various skeletal patterns.
Materials and methods: Conventional pre-treatment lateral cephalograms of 100 subjects aged 18–25 years were selected from the files of orthodontic patients based on anteroposterior skeletal pattern and facial divergence pattern. Subjects with Class I skeletal pattern (ANB 1–4°) were categorized into group A and group B depending on the measurements of Frankfort Mandibular Plane Angle (FMA) of 22–30° (normo divergence) and greater than 30° (hyper divergence) respectively. Likewise subjects with Class II skeletal pattern (ANB >4°) were categorized into group C and D, based on the above same divergence. The angular and linear measurements were recorded and measured. Statistical assessments include unpaired Student t-test and one-way analysis of variance (ANOVA).
Results: The vertical position of hyoid bone was not affected by nature of horizontal or vertical growth pattern of the face. The mean anteroposterior position of the hyoid bone among the 4 groups of subjects was statistically significant ($p < 0.05$). The position of hyoid bone in group D was significantly backward compared with the subjects in group A ($p < 0.05$) or group C ($p < 0.05$). The mean hyoid axis angle among subjects in the hyper divergent group (group B and group D) was high but insignificant.
Conclusion: The position of hyoid bone was most posterior in subjects with skeletal Class II malocclusion associated with mandibular retrognathism.

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1. Introduction

The hyoid bone is a horseshoe-shaped bone situated in the anterior midline of the neck between the chin and the thyroid cartilage and represents a link between the head and neck. It consists of five segments, namely, a body, two greater cornua, and two lesser cornua. It is connected to the pharynx, tongue, mandible and cranium through muscles and ligaments and forms a part of oropharyngeal complex. Though hyoid bone has no bony articulation, its muscle attachments play an important role in the maintenance of the pharyngeal airway, deglutition and phonation [1–3]. The position of tongue relative to upper and lower jaw is regulated in part by the position of the hyoid bone.

Hyoid, thus, functions as an anchoring structure and plays an important role in maintaining patent airway and regulating deglutition and mandibular movement [4]. Opdebeeck et al. attributed that many characteristics of long face syndrome to be associated with clockwise rotation of mandible "in concert" with the hyoid, tongue, pharynx and cervical spine [5]. Mandibular set back surgeries in hyperdivergent facial type demonstrated close association between hyoid position and concomitant mandibular position [6]. The stability of the surgical results could be attributed to the specific orientation and function of the associated muscles anchored to the hyoid and other functional cranial components. The relationship of hyoid to the skeletal and soft tissue composition of the head and neck exemplifies its pivotal role in the craniofacial complex.

Previous investigations have attempted to clarify the interaction between facial types and skeletal malocclusion and hyoid position, but no definite consensus exists. It was demonstrated that subjects with Class II skeletal pattern had a posterior position of hyoid [1,7,8]. However, the nature and composition of Class II pattern with reference to the extent of maxillary or mandibular contribution to Class II anomaly was not considered in any of the earlier investigations. Thus, with the existence of protean characteristics in skeletal Class 2 malocclusion, the intent of the present investigation was to examine the position of hyoid in different anteroposterior and vertical craniofacial patterns.

2. Materials and methods

The sample consisted of pre-treatment lateral cephalograms of 100 subjects aged 18-25 years selected from the files of orthodontic patients at the Orthodontic department, Vishnu Dental College, Bhimavaram, India. Cephalograms pertaining to the age group of 18-25 years were selected for the study to minimize the influence of growth and to maintain homogeneity in the sample. The following exclusion criteria were applied for the selection of lateral cephalograms: subjects with mouth breathing and sleep disorders, anomalies of cervical vertebrae, a previous history of orthodontic treatment and/or functional jaw orthopedic treatment, history of surgery involving the jaws, adenoids, hyperplasia of tonsils and adenoids, anterior and posterior open bite and cross bite, craniofacial anomalies and asymmetry of the face.

All the subjects were conveniently divided equally into 4 groups, based on anteroposterior skeletal pattern and facial divergence. Subjects with Class I skeletal pattern (ANB 1°–4°) were categorized into group A and group B depending on the measurements of Frankfort Mandibular Plane Angle (FMA) of 22°–30° (Normo divergence) and greater than 30° (Hyper divergence) respectively. Likewise subjects with Class II skeletal pattern (ANB >4°) were categorized into group C and group D, based on the above same divergence factor. The type of molar relationship was not considered when subjects were selected for the study.

All the lateral cephalograms were taken using the same radiographic unit (X — Mind Panoceph, Satelec). The x-rays were shot using the standard operating procedures that involved guiding the subjects to remain standstill with the lower jaw in rest position while the head was fixed in the cephalostat. The magnification factor was set at 1.3 in the scale. They were manually traced on acetate paper with 0.5mm lead pencil. The landmarks used in this study to evaluate the hyoid position were included from previous investigations [1,7]. The angular and linear measurements are represented in Fig. 1. Ethical committee clearance from the Institutional review board and ethical committee of Vishnu

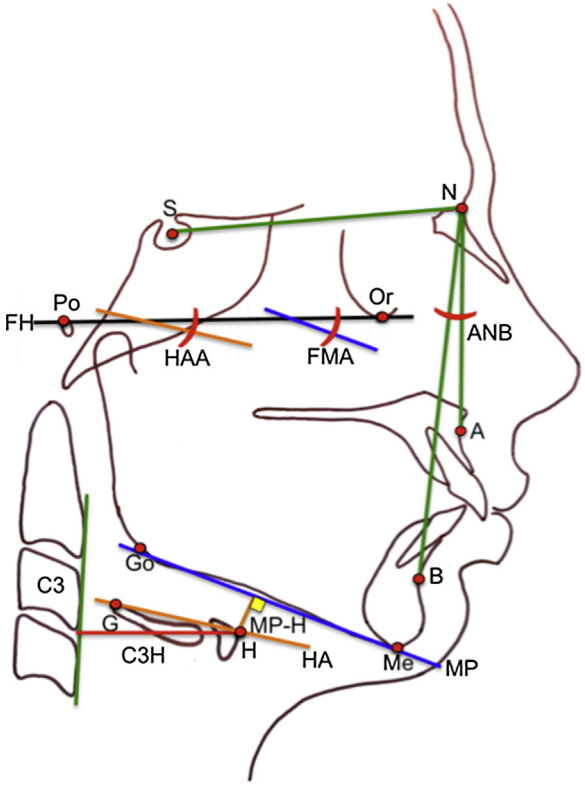

Fig. 1 – Cephalometric landmarks and angular and linear parameters. C3, third cervical vertebra; H (hyoidale), anterior-superior tip of hyoid bone; G-point, most posterior point of the greater cornu of the hyoid bone; HA (hyoid axis), line that connects points H and G; MP-H, perpendicular distance from anterior-superior tip of hyoid bone (H) to mandibular plane (MP); C3H, linear distance between anterior-superior tip of hyoid bone (H) and antero-inferior limit of third cervical vertebra (C3); HAA, angle formed by the hyoid axis (H axis) and Frankfort Horizontal plane (FH).

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