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Research

A cone-beam computerized tomography assessment of the relationship between upper incisors inclination and articular eminence features in orthodontically untreated patients with different facial type

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ABSTRACT

Objective: To compare the features of the glenoid fossa and the upper incisor inclination in orthodontically untreated individuals with different facial types (i.e., short-, normo-, long-faced subjects) and to assess the existence of any correlations between the articular and incisor paramaters by means of cone-beam computed tomography.
Materials and Methods: Sixty (N = 60) untreated individuals aged 18 to 40 years, subdivided into three groups based on facial type, underwent cone-beam computed tomography assessment of the following measurements: glenoid fossa size, articular eminence angle with respect to the sella nasion plane and inclination of the axis and lingual surface of the upper central incisor with respect to the sella nasion plane.
Results: Comparison of the features of temporomandibular joint fossa in the three facial types showed the absence of significant differences. As for the incisor parameters, no significant differences among the three facial types were detected, with a minor exception: the incisal margin/cingulum angle between short- and long-faced subjects (101.86° vs 95.70°; $P = 0.024$). Correlation analyses shows the absence of any significant relationships between features of the glenoid fossa and incisor inclination both in the overall sample and the different facial morphology groups.
Conclusions: There are no differences between the features of the glenoid fossa and the upper incisor inclination in subjects with different facial types, as well as there is an absence of clinically relevant relationships between the articular shape and incisor inclination.

1. Introduction

There is general agreement that features of the natural dental occlusion are not related to disorders of the tempororomandibular joint (TMJ) [1–3]. Notwithstanding most orofacial pain literature, studies showed that the predictive value of occlusal variables for TMJ disorders is, at best, low [4–6]. It seems that old-fashioned claims that correction of purported dental malocclusion is necessary to prevent damage to the TMJ are still alive within some orthodontic communities [7,8].

The diminished role of dental occlusion abnormalities as a risk factor for TMJ disorders does not imply that an accurate functional analysis of the orthodontic is not necessary [9]. This is generally carried out via clinical assessment [10,11]; however, determining the correct dental positioning based on the functional demand still remains a tricky issue in the clinical setting [12].

The various orthodontic techniques tend to rely on statistical means rather than individual measurements and are often based on very dissimilar values. In this regard, for example, there was much discussion on the correct position that the upper incisors should have at the end of treatment [13,14].

The measurement of the position of the upper incisors on the sagittal and vertical planes helps in determining the anterior limit of the dentition (i.e., anterior determinant); the first attempt

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Authors have obtained and submitted the patient signed consent for images publication.

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to define the parameters of this limit dates back to Tweed, who proposed his diagnostic triangle in 1945 [15]. In that work, he suggested the ideal values for the IMPA (i.e., the angle indicating the inclination of the lower central incisor with respect to the basal bone of the lower jaw) and the FMIA (i.e., the angle relating the inclination of the lower central incisor with the cranial base). These values are still considered by many a reference for a correct positioning of the incisors and a stable orthodontic outcome [15]. In the following years, several other parameters were proposed to determine the correct position of the upper central incisors, such as, among others, the distance between the upper incisal margin and the line that goes from point A to the pogonion (A-Pg), the distance between A-Pg and the upper central incisor margin, the cranio-incisor angle, the angle between the upper incisor axis and the bispinal plane (SNA-SNP), and the line N-A (Nasion–point A).

Along with the incisor position, the stability of orthodontic treatment is also influenced by several other anatomical and functional factors [16]. Among those, the condylar guide has been seen for decades as a factor potentially influencing the anterior determinant of dental occlusion [17–19].

The condyle guide is, in fact, the posterior wall of the articular eminence, which restricts and guides the mandible movement. Thus, jaw movements may be influenced by the articular eminence angle (i.e., posterior determinant). Indeed, a steep inclination of the eminence determines a rapid disocclusion of the posterior teeth during lateral and protrusive movements. Similarly, the incisor guide is the inclination of the lingual surface of the upper incisors from the point of contact with the antagonist tooth to the incisal margin. The relationship between the anterior and posterior determinants of occlusion (i.e., incisal and condylar guides) has been considered by some an important factor in orthodontic treatment planning, but the literature on such features in patients with different facial morphology is scarce.

Within these premises, the present investigation was performed to answer the twofold clinical questions: "1. Are there any differences between the features of the glenoid fossa and incisor inclination of patients with different facial types (i.e., short-, normo, long-faced subjects)? And 2. Is there a relationship between upper incisor inclination and articular eminence features in the three facial types?" The null hypotheses were that no differences exist between the articular and the incisal guides features in the three facial types and that the articular and incisor parameters are not correlated.

Fig. 1. Plane of reference.

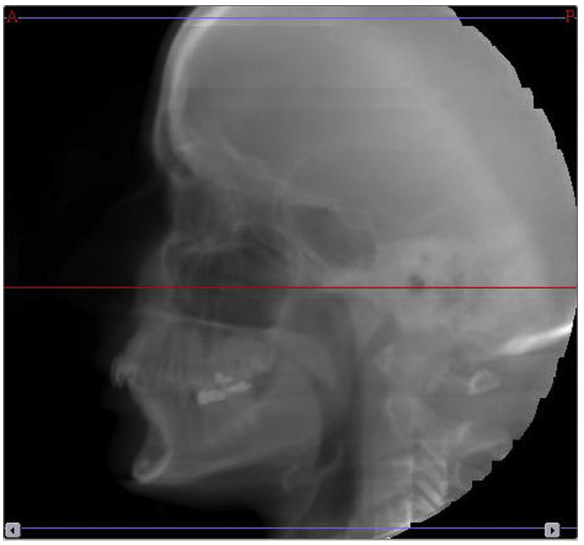

Fig. 2. Sagittal view of horizontal reference axis.

2. Materials and methods

The study protocol was approved by the institutional review board of the University of Ferrara Post-Graduate School of Orthodontics. The protocol number is 110121.

The initial sample consisted of 191 patients aged between 18 and 40 years who had undergone cone beam computerized tomography (CBCT) for otolaryngology reasons (i.e., sinusitis, cysts of the

Fig. 3. Axial section at condyles.