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Condylography in orthodontic evaluation: study of condylar rotation in non-dysfunctional patients

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Purpose: Cadiax 2 compact is a computerized axiograph capable of producing axiograms of three-dimensional mandibular movements. This technology is considered accurate and precise to measure the horizontal condylar inclination (HCI) and the Bennett angle [1,2] and allows the processing of curve data through software and the calculation of significant numerical parameters for the formulation of observations of clinical interest. In this preliminary study, measurements were carried out in non-dysfunctional patients applying for orthodontic treatment in order to verify the variability of the curves and intercept any temporomandibular dysfunction before treatment.

Materials and Methods: 19 patients applying for orthodontic treatment aged between 13 and 24 were recruited at the Orthodontic ward of IRCCS Ca' Granda Policlinico Hospital Fundation of Milano. Patients with a history of systemic arthropathies or arthritis, postural pathologies, history of facial trauma, previous orthognathic treatments or prosthetic rehabilitations, history of pain or temporomandibular dysfunction were excluded. Were also excluded patients who complained pain on pressure at physical examination, joint noises and maximum opening <40 mm. The CADIAX compact 2 system was used for arbitrary recordings. This means that the registration of the movement of the mandibular joint was made on one point of the axis anatomically identified hinge. The reference coordinates of the system originate from the central point between the condyles, where the hinge axis, in the zero (centric) position, intersects with the median-sagittal plane. A kinematic face bow (Condylcgraph) was used for the recordings. All the recordings in their entirety, including the preparation phases and the determination of the hinge axis, were performed by the same operator. A complete axiographic exam was performed [3] but a selection of non-guided open/close curves was tracked for the analysis. Each record therefore included: 1) Electronically recorded jaw movement tracks; 2) Measurement of the condylographic position (CPM); 3) X / Y / Z coordinates of the tips of the cusps of the teeth of the mandible. The registration data was exported to GAMMA Dental Software and subsequently processed with CADIAX Analyzer. The evaluation of the relationship between translation and rotation is useful only for open/close movements. The evaluation of the relationship between translation and rotation is useful only for open/close movements. This relationship is expressed by the γ angle which is defined as rotation in relation to the maximum distance and allows to evaluate the uniformity of the rototraslation and the maximum opening of the mouth obtained in individual movements. The γ angle values were gathered for each curve and compared to the average values reported in the literature (Figure 1).

Results and Conclusions: In our sample a mean γ angle value of 15.789° ± 9.108° at 3 mm was reported (Table I). Although this investigation was performed in patients who were not frankly dysfunctional, our data show sub-clinical alterations of the condylar dynamics. In conclusion, non-guided open/close curves were selected in representation of habitual function and our results proved for a slightly inferior average γ angle than expected. Results from this preliminary study should be verified in a larger sample, however it is reasonable to state that the condylographic examination could intercept risk conditions for temporomandibular dysfunction in the pretreatment phase and allows further diagnostic investigations in the gnathological field.

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