THE DIFFERENTIAL DIAGNOSIS OF THE THIRD CLASS OF MALOCCLUSION

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Annotation. *The purpose of this study was to investigate the published evidence regarding the association between the mean values of some cephalometric parameters and their relation to the different types of the clinical formes of mesial bite or third skeletal class of malocclusion. During our investigation we have been improved the efficiency of diagnosis of various clinical forms of me-sial bite by identifying and systematizing of the cephalometric indicators. The study involved 43 pa-tients aged 9 to 32 years (23 females and 20 males) with different clinical forms of the mesial bite (class 3 of malocclusion). In the study used clinical and X-ray methods. Clinical method consisted in examining patients with dentition abnormalities class 3 occlusion anomalies. X-ray method was to study the lateral x-rays of patients and analysis by Bjork, Steiner, Downs, Kim by a computer soft. A comparative analysis of the following parameters: angles ANB, SNA, SNB, ILs / NL, ILi / ML, ILs / Ili, WITS. Based on clinical studies and analysis of X-rays of the patients unable to determine that when clinical forms of third class (progenic mesial bite and progenic neutral occlusion) are ex-pected difference of digital options along with morphological changes that reliably indicates the se-verity of the anomalies based on variants of mutual location of various anatomical struc-tures.Moreover, in the course of the work found that the value of the cephalometric parameters nec-essary for diagnosis when considering teeth anomalies in the sagittal plane are essential to classify the different types of nosology forms of diseases depending on the value of angular parameters.*

Key words: *progenic mesial bite, progenic neutral bite, cephalometric dimensions.*

Introduction. In the diagnosis of dental anomalies, the frequency of mesial occlusion in the structure of dental anomalies is 2-6 % [2, 3, 4].

The causes of this kind of the bite disorder can be varied: hereditary pre-disposition, hypodonty and retention of the teeth in the upper jaw, chronic in-flammation in the upper jaw, trauma, macroglossia, as a determining factor in the pathological development of the lower jaw, premature loss of milk teeth in the upper jaw, early operative interventions on the upper jaw for one- and bilateral palatal clefts, excessive prognathic position of the lower jaw [1, 3, 4].

The development of progenic bite can occur both with impaired growth in the upper and lower jaw, and with a combination of the normal growth of one jaw and atypical growth of the other.

The mesial bite is formed as a result of developmental disorders as the up-per jaw as a whole (upper jaw micrognathia), impaired development of the frontal portion of the upper jaw, retroposition of the upper jaw in relation to the structures of the anterior

cerebral plane, retroposition of the upper jaw at the normal position of the upper and lower jaws in the facial skeleton and as a result of the normal growth of the upper jaw and symmetric hyperplasia of the lower jaw (mandibular bend ia, true progeny, macrognathia of the mandible. Also, the manifestation of mesial occlusion in the oral cavity will be observed with a com-bination of retroposition of the maxilla and prognathic position and the mandi-ble, which will be represented by a pronounced clinical form of progenic mesial bite and neutral bite [2].

In the diagnosis of dental anomalies a cephalometry is an additional meth-od of the investigation has one of the leading roles [1, 5-7].

X-ray method of research, the principle of which is to increase the distance between the tube and the film up to 1.5 m, while placing the cassette with the film close to the head of the subject. The analysis of cephalograms (radiographs of the head), is a x-ray analysis, which allows you to:

1. To determine the direction of growth of the facial skeleton.
2. Differentiate anatomical variants and various clinical forms of dental anomalies.
3. To determine the gnathic and alto alveolar patterns in the formation of a dental-maxillary anomaly.
4. The study of the ratio of soft tissue to the facial skeleton [1, 6-8].

Cephalometric analysis of the head in the lateral projection was performed according to the Steiner, Bjork, Downs, Tweed, Kim method, which included as-sessment of the facial skeleton, teeth and soft facial tissues.

1. Steiner's Analysis : measurements of SNA, SNB, ANB, NSL / Go-Gn Basis angles .The assessment of the location of the apical bases of the upper and lower jaws was carried out by measuring the angles of SNA and SNB.

The SNA angle (mean values of the norm – 82 degrees) indicates the basic position of the upper jaw relative to the anterior skull base. With a decrease in angle to 78 degrees, the upper jaw will be in the retrognathic position, and when enlarged to 85 degrees - in the anterior position relative to the base of the skull.

The SNB angle (mean norm norm – 78 ± 2◦) determines the position of the mandible relative to the anterior skull base. At values of the angle of less than 76 degrees the lower jaw is in the posterior position (the tendency towards the skele-tal class 2), and at a value greater than 80 degrees – in the anterior due to the base of the skull (the tendency to the skeletal class 3).

The angle ANB (the difference between the angles of SNA and SNB, the average norm of the norm - 2 degrees) determines the inconsistency of the size of the apical bases of the upper and lower jaws.

The Go-Gn to NSL angle is located between the bases of the upper and lower jaw, determines the type of their growth and the location of the articular head, is the main indicator in studying the vertical proportions of the tooth-jaw system.

Interincisal angle (ii) – the angle between the lines passing through the cen-tral axis of the upper and lower central incisors is normally 130-135. Reducing the size of the angle occurs in the protrusion, and the increase – with the retru-sion of the front teeth.

Upper incisor to NA (average values of norm – 22) is the angle of inclina-tion of the most advanced before the upper incisor relative to the line NA. With its reduction, there is a retrusion, and with an increase - protrusion of the upper incisors.

Lower incisor to NB (average value of norm – 25) is the angle of inclination of the most advanced before the lower incisor in relation to the line NV. With its reduction there is a retrusion, and increase - protrusion of the lower incisors.

2. In addition to the measurements carried out by Bjork, additional studies were carried out on the following parameters:

N-S-Ba (131) is the angle of inclination of the base of the skull: when the angular values are increased, the retrograde type of profile, with a decrease in the angle-prognate type of profile.

NL / ML (25) – angle of bases (basal angle) by Schwarz: increase of angle –posterior rotation of the lower jaw, vertical direction of growth; angle reduction – anterior rotation of the lower jaw, horizontal direction of growth.

NL / NSL (8.5) – inclination angle of the upper jaw: angular enlargement-posterior rotation of the upper jaw relative to the plane of the anterior skull base; angular reduction anterior upper jaw rotation.

ML / NSL (33) – inclination angle of mandible: angular enlargement-posterior rotation of the mandible, tendency to vertical type of growth; angle re-duction – anterior rotation, a tendency to a horizontal type of growth of the mandible.

Ar-Go-Me (128) – angle of the mandible: increase of angle-vertical type of the growth of the lower jaw; reduction - horizontal direction of growth.

N-Go-Ar (52) and N-Go-Me (72) top and bottom Go: increase the angle of the vertical direction of growth; reduction of the angle-horizontal direction of growth.

S-N-Gn (Y-axis) (59-66) – angle of Y axis: increase of angle-vertical growth pattern, dolichocephalic face type; reduction of angle values-horizontal type of growth, brachycephalous face type.

The sum of angles for Bjork (N-S-Ar + S-Ar-Go + Ar-Go-Me) (394).

3. Additional parameters from Downs analysis:

N-Pg-FH (82-95) is the inner lower corner between the Frankfurt skyline FH and the faceplate NPg. It clearly demonstrates the degree of protrusion or ret-rograde of the mandible relative to the base of the skull.

N-A-Pg (10) – angle of convexity. Determines the degree of retraction or re-traction of the upper jaw relative to the facial plane (N-Pg). The location of the A point ahead of the faceplate is the positive value of the angle, the location of the point A behind the plane is negative.

Ocp-FH (9.3) is the angle of inclination of the occlusal plane relative to the Frankfurt skyline.

4. Additional parameters from Tweed analysis:

The value of the Tweed parameters for our scientific work can hardly be overestimated due to the value of the final position of the lower incisors as the ul-timate factor of occlusion and aesthetics of the face and one of the factors pre-venting recurrence in the

therapy of dental accumulation.

IMPA (90) – the length of the longitudinal axis of the lower incisors (II) to the mandible (MP).

FMPA (24) is the angle between the Frankfurt Horizontal plane (FH) and the mandibular plane (MP).

FMIA (66) is the angle between the lower incisor axis and the Frankfurt plane(FH).

Triangle by Tweed (IMPA + FMPA + FMIA) = 180.

5. Additional parameters from Kim's analysis:

The ODI (Overbite Depth Indicator) (AB to MP + FH to PP) (74.5) is the total value of several important parameters: the angle between the AB line and the lower edge of the mandibular plane on the one hand, and with the addition (subtraction) of the angle values between FH line and PP plane. Plane angle PP: If the plane of the PP is visually higher than the F-H position, then the angle has a negative value (-) and as a consequence, diagnose the tendency to open the bite; if the direction of the plane PP to F-H is down, then the bite problem is bound to the bite depression and the angle has a positive value (+). If the ODI value is less than 65 – diagnose the tendency to open the bite; if the ODI value is more than 77.7, there is a clear tendency toward bite depression.

For our work, it is very important that, if the patient has high ODI values (more than 77.7), this is a manifestation of the greatest tendency for the for-mation of the accumulation of the mandible and the formation of deep bite with subsequent recurrence of the accumulation of teeth.

APDI (Anterior-posterior Dysplasia Indicator) (Facial Angle N-Pg-FH + - AB plane angle AB to N-Pg + -PP anle).

Characteristics of the corner are as follows:

1. The position of the mandible is described by the angle N-Pg-FH (Facial Angle).

2. The angle of the plane AB to the N-Pg with the sign + if the point A has a posterial localization, and accordingly follows with the sign-if point A has aner-ial localization with respect to point B.

3.Cut the plane of the PP to FH with the sign + if the direction is down, the angle of the plane PP to FH with the sign «-» if the direction of the plane of the palate is up.

The mean values of the 81.47 angle characterizes skeletal class 1; more than 85 – tendency to the skeletal class 3; less than 77-tendency to the skeletal class 2. From a prognostic point of view, for the formation of a stable effect after the completion of orthodontic treatment, it is important that if after treatment of patients with grade 2 and the initial APDI 70 after the completion of the active phase of treatment, the rate varies to 80 this and is a prognostic indicator of the stability of the treatment, otherwise, if the APDI parameter is not in accordance with 80, there remains a threatening tendency for relapse of the pathology of class 2 and, accordingly, the accumulation of teeth.

The sum of ODI + APDI-is defined as a Combined Factor (CF). The classi-fication of pathologies of the tooth-skeletal system will also occur depending on the indicators and the combined factor including. The average clinical values of the skeletal class 1 diagnosis are as follows: 74.5 / 81.4 / 155.9 (ODI + APDI + CF). If the CF value is

more than 155, it looks like a high combined factor and can indicate a low angle and a horizontal direction of growth type, and vice ver-sa, if the CF value is less than 150 degrees then the presence of a low combined factor and a high angle and vertical type of growth are recorded.

The calculation of lateral X-ray cephalograms allows determining the pa-thology in the sagittal and vertical planes and will be one of the determining di-agnostic criteria determining the clinical form of malocclusions.

Materials and methods. We examined 43 patients in retaliation from 9 to 32 years (23 females and 20 males) with various clinical forms of the mesial bite. The study used clinical and radiological methods.

The clinical method was to examine patients with dentalalveolar anomalies of class 3 of malocclusion. The X-ray method consisted of examining patient cephalograms and performing a cephalometric analysis by Bjork, Steiner using a computer program. Change in angle values ANB, SNA, SNB, ILs / NL, ILi / ML, ILs / Ili, WITS.

Results. As a result of the work that has done, the following cephalometric characteristics were identified and studied:

ANB angle (ss-n-sm) is the maxillary angle which characterizing the inter-position of the bases of the upper and lower jaws in the sagittal direction. When the maxilla has retro- or micro-gnathia, the value of this angle decreases or be-comes negative values. A negative value is formed in situations where the apical base of the lower jaw is located in front of the apical base of the upper jaw (rate 3).

SNA angle (s-n-ss) – characterizing the location of the anterior apical base of the upper jaw in the sagittal direction (norm 82)

Angle SNB (s-n-sm) – characterizing the location of the anterior apical base of the mandible in the sagittal direction (norm 79).

Angle ILs / NL incisor-maxillary angle resulting from the intersection of the plane of the central incisors and the plane of the base of the upper jaw and char-acterizing the inclination of the incisors of the upper jaw relative to the plane of the upper jaw (norm 110)

The angle ILi / ML of the lower incisor-jaw angle resulting from the inter-section of the incisor plane and the plane of the mandible base and haarterizing the inclination of the mandibular incisors relative to the mandible plane (norm 94).

WITS is measured as the projection distance ss and sm on the occlusal plane. With the front location of the projection of the point A, the distance is considered positive, while the opposite location is negative.

Based on the conducted clinical studies and analysis of lateral cephalo-grams of patients, it was possible to determine that in clinical forms of progenic occlusion, there are expected differences in digital parameters in parallel with morphological changes, which will reliably indicate the severity of anomaly de-pending on the relative positions of different anatomical structures.

Analysis in the sagittal plane:

1. Dento-alveolar relationships. In case of the increased overjet we have a situation with the discrepancy in the sagittal plane as the result of one or more of the following factors

1) increased alveolar prognathy in the upper jaw
2) alveolar retrognathy in the lower jaw
3) protrusion of the upper incisors
4) retrusion of the lower incisors
5) retrusion of the mandibular base compared with the maxillary base.

The first four represent the dento-alveolar discrepancies whereas the fifth must be regarded as a basal discrepancy i.e. a discrepancy in the relation-ship to the two jaw bases, and is described as the sagittal jaw relationship. The extent of alveolar prognathism is measured by the angle pr-n-ss and in the lower jaw by the angle between the chin line and ML. Both measurements represent the position of the alveolar process in relation to the jaw base. The inclination of the upper incisors is indicated by the angle ILS/NL and in the lower jaw by the angle ILi/ML.

The difference between the protrusion of the upper and lower jaws, de-scribed as the sagittal jaw relation, is measured by the angle ss-n-pg With regard to the upper jaw the same point as in the sagittal jaw relationship i.e. ss (Down's A point) is used. The reason is that in practice it is very difficult to differentiate between the jaw base and the apical base, though in the case of growth analysis the anterior nasal spine (sp) is used as a reference point.

In the lower jaw there is a special reference point for the apical base, sm (Down's B point). Another way of describing the sagittal apical base relationship is by the angle ANB.

The apical base relationship can very considerably from the skeletal base depending on variations in the inclination of the mandible and of the prominence of the symphysis.

Incisal sliding is noted if it is observed in the clinical examination. Such "posturing" can result in false values of the sagittal jaw relationship and the api-cal base relationship as the mandibular is translated forward to obtain habitual occlusion (e.g. pseudo class III).

If the measurements of the dento-basal relationship have established that a discrepancy in the sagittal jaw relationship is present, it is of importance to de-termine whether this is caused by the maxilla being protruded in relation to the cranial base while the mandibular position is normal or whether the maxillary position is close to the mean values while the lower jaw is retruded in relation to the cranial base. Both possibilities will result in an increased overjet.

Cranial relationships are described as a position of the two skeletal bases are evaluated in relation to the anterior cranial fossa.

In the sagittal plane the position of the maxillary skeletal base in relation to the cranial base is described by the angle A-N-B.

a) If the maxillary skeletal base is anteriorly displaced – an increase in the angle will exist – probably indicating maxillary prognathism.

b) If the angle is less than the average that is the maxillary skeletal base is more posteriorly placed than normal consequently, maxillary retrognathism is indicated.

The position of the mandibular skeletal base is evaluated in a similar way from the angle s-n-pg. Corresponding to the expression used for the upper jaw the term mandibular prognathism is describing cases with an increased s-n-pg angle. When this angle is less

than the average value the term mandibular retrog-nathism is used.

In cases where both the upper and lower bases are protruded the situation is described as one of total facial prognathism.

In the case of the similar retrusion of the jaw bases is used the term- total facial retrognathism. In cases of total facial prognathism or retrognathism the sagittal jaw relationship can be normal.

Development of the cranial base influences the shape of the face. In the case of a bent cranial base i.e. with a small angle s-n-ba, the maxillary complex, be-cause of its attachment to the cranial base, is placed further forward in relation to the anterior crania base. Bending of the cranial base influences the position of the mandible through the articular fossa situated on the external cranial base in the middle cranial region. In the case of a bent cranial base the mandible is therefore often positioned further forward in relation to the anterior cranial base resulting in a total facial prognathism. Definetly, in the case of individuals with a flattened cranial base, that is, where the n-s-ba angle is greater than average the upper face is retruded, in relation to the anterior cranial fossa, the middle and posterior cra-nial fossae are placed further back and higher up. This influences the position of the mandible because the articular fossa is placed further back and thus the man-dible itself is also further back. The facial skeleton in the case of flattened cranial base is characterized by both upper and lower jaws being positioned further back, i.e. total facial retrognathism.

The clinical cases (seven clinical cases presented)

1 clinical case.

The cephalometric values in the study of lateral TRG in this clinical case indicate that:

ANB -2.9, SNA 79.5, SNB 82.4, ILS / NL 101.9, ILI / ML 90.9, WITS 10.5, ILS / ILI 142.1, A / PG 2.7, indicating: maxillary retrognathia, mandibular prognathia, decompensation retrusion of the frontal teeth close to the normal po-sition of the teeth of the frontal section of the mandible, which in general will de-termine the pathology as a progenic mesial bite.

2 clinical case.

The cephalometric values in the study of lateral TRG in this clinical case:

ANB 3.4, SNA 88.7, SNB 85.3, ILS / NL 105.4, ILI / ML 101.0, WITS -0.4, ILS / ILI 127.5, A / PG 5.7, which indicates a harmonious arrangement of the jaws, retrusion of the frontal region of the maxilla, protrusion of the teeth frontal area of the mandible, which defines the pathology as progenic neutral bite.

3 clinical case.

The values of the ANB-3.6, SNA 87.0, SNB 90.6, ILS / NL 128.7, ILI / ML 93.6, WITS -6.4, ILS / ILI 124.8, A / PG 3.7, maxilla retrognathia, compensatory protrusion of the frontal teeth of the mandible, that in a complex with clinical methods of examination determines pathology as progenic mesial bite.

4 clinical case.

The values of the ANB -3.6, SNA 84.0, SNB 87.6. , ILS / NL 107.6, ILI / ML 68.8, WITS -7.3, ILS / ILI 162.9, A / PG 3.7. The prognathic position of the mandible,

compensatory retrusion of the frontal upper teeth, which, in combina-tion with clinical examination methods, determines pathology as progenetic me-sial bite.

5 clinical case.

The values of the ANB -1.1, SNA 79.5, SNB 80.6, ILS / NL 110.7, ILI / ML 88.7, WITS-3.2, ILS / ILI 139.4, A / PG 5.2, indicating maxillary retrogna-thia, mandibular normal position, compensatory retrusion of the frontal teeth of the maxilla, combined with clinical examination methods, determines pathology as a progenic neutral bite.

6 clinical case.

The values of the ANB 0.3, SNA 82.3, SNB 82.0, ILS / NL 113.4, ILI / ML 93.4, WITS -3.5, ILS / ILI 127.9, A / PG 6.1, indicating the normal position of the upper jaw in the facial skeleton, mandibular prognathia, normal tooth inclina-tion frontal parts of the maxilla and mandible, which in combination with clinical examination methods, defines pathology as progenic mesial bite.

7 clinical case.

The values of the ANB 2.1, SNA 87.3, SNB 85.2, ILS / NL 103.4, ILI / ML 99.9, WITS -2.1, ILS / ILI 136.6, A / PG 2.7, indicating the normal position of the jaws in the facial skeleton, retrusion of the frontal portion of the upper jaw and protrusion of the teeth of the frontal mandible,that, in combination with clin-ical examination methods, defines pathology as a progenic neutral bite.

Conclusions. Thus, in the course of the work done, we found that the val-ues of cephalometric parameters required for diagnosis when examining dentofa-cial anomalies in the sagittal plane (progenic bite) are essential for clarifying the nosological forms of diseases depending on the values of the angular and linear parameters and their mutual combinations.

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