The theme of the class № 9

Clinical manifestation and diagnosis of the distal bite

The content of the topic:

Posterior occlusion has characteristic facial and intraoral signs. The most significant facial sign of prognathic occlusion is upper jaw protrusion and lower jaw distal position.

As for other facial signs, e.g. the height of the lower part of face, it may change. Thus, if posterior occlusion combines with deep overbite, it has a tendency to reduction, and at combination with open bite – to increase. Naso-labial and mental folds expressiveness also depends on that.

At posterior occlusion combined with deep overbite the naso-labial folds and especially the mental one are more expressive. The lower lip looks valgus; the upper teeth are located on the red border of the lower lip, leaving imprints on it. The mandible angle is reduced.

If posterior occlusion is combined with open bite, facial expression is forced, the naso-labial folds are smoothed. Besides, the "thimble" symptom appears at swallowing saliva. The mandible angle is more than 123°.

At upper frontal teeth protrusion the orbicular muscle of mouth is underdeveloped, the upper lip is shortened, the oral cavity is opened. These signs expressiveness depends on upper teeth protrusion degree.

Intraoral signs of posterior occlusion are characterized by prognathic dental arches correlation in the frontal and lateral parts. Violations in the frontal part declare themselves by forward upper dental arch displacement. Sometimes this displacement is conditioned by upper teeth protrusion, in other cases it takes place at the expense of the bone base. At that the upper frontal teeth may be located fanlike with spaces, without spaces, densely, and with opisthognathic inclination. The crown part of the frontal teeth seems enlarged, its cutting edge may have defects because of mechanical injuries.

If the upper frontal teeth protrude, there appears the so-called sagittal fissure between them and the lower frontal teeth. It may be different by length and size, sometimes being 10 mm and more. At upper frontal incisors protrusion the sagittal fissure is always bigger than at retrusion. Overbite depth in the frontal part at posterior occlusion may be different. If posterior occlusion is combined with deep overbite, the lower frontal teeth touch the mucous tunic of the hard palate, injuring it and leaving cutting edges' imprints on it. At that dental and alveolar arches deformation is most evident in the vertical direction. The alveolar processes are higher in the frontal parts of the upper and lower jaws than in the lateral parts. The closure line looks like a step. If posterior occlusion is combined with open bite, the lower incisors edges do not touch the mucous tunic. D.A. Kalvelis notes that fanlike location of the upper frontal teeth may take place also at normal dental arches correlation in the lateral parts. A.V. Slaydyn names such dento-gnathic deformation "frontal prognathism", A.I. Betelman – "upper frontal teeth protrusion", V.Y. Kurliandskyi and L.V. Ilyina-Markosian – "frontal or false prognathism", and L.P. Hryhoryeva – "prognatic neutral occlusion".

To detect the severity degree of this anomaly one should take into consideration the degree of mesiodistal displacement in the lateral parts. At posterior occlusion the lateral teeth are in distal correlation, at that the mesiobuccal tubercle of the upper 6th tooth does not get into the fissure of the similar lower tooth, but is located in front. Mesio-distal displacement degree may be by 1/2 of the tubercle, 1 tubercle and more.

Besides, transversal lateral teeth correlation is very important. Posterior occlusion is often combined with jaw narrowing. The narrowed upper jaw may have different shapes (V-like, U-like). According to Kalvelis, upper jaw narrowing changes the form of both upper and lower dental arches, becoming trapeziform, which worsens the anomaly.

Functional violations are also important. Breathing function is violated in patients with posterior occlusion. As a result of chronic diseases of the upper air passages, and also adenoid tissue excrescence, nasal breathing is disturbed. According to statistics, in 50 % children with prognathism vital lung volume is reduced by more than 20 %. Insufficient oxygen supply and redox processes violation in the organism lead to the inhibition of somatic and psychic development of the child.

The orbicular muscle in patients with posterior occlusion is underdeveloped, the oral cavity is constantly opened. Because of mouth breathing and open lips mouth cavity impermeability is violated, tongue position changes, which leads to double chin formation. Besides, the function of swallowing is disturbed in 83.6 % of patients. When the oral cavity is closed, the face has a forced expression, and at swallowing – the “thimble” symptom, i.e. dotted recesses on the chin skin, which indicates expression muscles hypertonus.

Patients with posterior occlusion very often have speech impairment. According to Z.P. Vasylevska, at prognathism tongue articulation zones form and location change on the palate at vowels pronunciation.

Mastication impairment arises at prognathism because of the decrease of the functioning mastication teeth surfaces area. The time of chewing food becomes longer, mastication efficacy and quality reduce.

At posterior occlusion carriage is often violated, bones ossification terms change.

Posterior occlusion should be viewed as a disease of the whole organism with local manifestations in the oral cavity, therefore it requires complex approach to differential diagnostics and treatment method choice.

In orthodontic practice, conducting differential diagnostics of posterior occlusion types, clinical tests, offered by Eschler-Bittner, are widely used. The tests consist in the following: the patient’s face form in profile is remembered at usual occlusion, then the patient is offered to protrude the lower jaw till the neutral correlation of lateral incisors:

- if face form improves at that, posterior occlusion is conditioned by lower jaw underdevelopment;

- if face form becomes worse, there are no indications to growth stimulation of the lower jaw, and the reason for occlusion anomaly lies in sizes violation or upper

jaw and dental arch position;

- if face expression improves at first and then becomes worse, posterior occlusion is caused by the violation of both jaws growth and development. Here it should be found out to what degree lower jaw growth is to be stimulated.

Depending on the degree of jaws development A.I. Betelman singles out four forms of distal occlusion:

- the 1st form – lower micrognathia;
- the 2nd form – upper macrognathia;
- the 3rd form – upper macrognathia and lower micrognathia;
- the 4th form – maxillary prognathism with constriction in the lateral areas.

Dento-alveolar form of distal malocclusion develops as a result of abnormal position of individual or groups of teeth, or if changed the shape of the alveolar process. A common feature of this form of distal occlusion is the discrepancy between the length of the dental arch and its apical basis on one or both jaws. By the profile cephalometric there are two most typical varieties of dento-alveolar forms:

1. The displacement of the upper posterior teeth with the forward tilt of the axes of the first upper premolars forward. Such violations usually occur as the result of early loss of deciduous molars or the frontal teeth on the upper jaw and the next mesial inclination of posterior teeth.

2. The retrusion of the alveolar process of the mandible in the front section. Such an anomaly is diagnosed on the basis of the evaluation of the cross-sectional shape of the chin, measuring the distance between points Pg and B, designed on mandibular plane.

Dento-alveolar form on the profile cephalometric is also characterized by:

- increase in the angle of the upper frontal teeth to the plane of the maxilla base (Sp). There are 4 degrees of protrusion of upper incisors: I degree – 56-61º, II – 51-56 º, III – 46-51 º, IV – 41-46 º;
- increasing of interdental distance (sagittal gap);
- change the angle of the lower incisors inclination to the plane of the mandible base (MP);
- discrepancy between the size of the angle of the facial profile convexity (n-sn-pg) and angle ANB and axial inclination of lateral teeth (front top, bottom, back);
- discrepancy between the size of the angles ABSp, MM. The difference in the size of the angles reflects the differences in the sagittal position of the points A, B, and Pg, that is, allows you to set the ratio apical basis of dentition and the bodies of the jaws. When underdevelopment of the apical basis of the lower dentition lip-chin fold is pronounced; the protrusion of the bone of the chin affects the size of angle MM. Angle ABSp characterizes the location of the alveolar process of the mandible relative to the alveolar process of the maxilla, MM angle – the position of the body of the mandible. The study of these angles values of and their differences is important to identify gnathic or dento-alveolar forms of malocclusion.

When gnathic forms of distal bite are the following changes in the maxilla: the upper jaw is elongated; it can be advanced forward relative to the plane of the skull base (N-Se). At the front position of the upper jaw, aesthetic violations are pronounced. The shape of the face in profile when the elongation of the maxilla and

its anterior position of the convex or very convex. It is broken the stronger, the more angles ANB, MM, B and smaller angles of inclination and horizontally. Can be observed and changes in the lower jaw: its body can be shortened, and is located distal to due to reduced size of the mandibular angles, or the bent necks of the articular processes ago, the branches of the lower jaw shortened. When gnathic form, which is caused by violations on the part of the lower jaw, the angle ANB is greater, the more pronounced the shortening of the mandibular body. Violated the aesthetics of the stronger, the larger basal angle (B), and located above the joints.

The mixed form is quite common and is defined dento-alveolar and gnathic changes from the upper and lower jaw.

For differential diagnostics of various clinical forms of biometric study of the jaws diagnostic models on the methods of Pont, Tonn, Korkhaus, Gerlach, Howes-Snagina; anthropo - and photometric study of the patient's face; functional studies, etc.

Craniometry:

Determination of jaws location – the main aim of craniometric researches is in relation to the plane of frontal part of the skull basis, i.e. determination faces type and determination of deviations from middle sizes that are characteristic for a normal bite to the same type of face.

Craniometry helps to define:

1) Location of jaws, i.e. gnathic parts of facial skeleton in sagittal and vertical directions in their relation to the plane of frontal part of skull basis:

1) in sagittal direction: anterior, middle or posterior location of gnathic part;

2) in vertical direction: inclination of gnathic part upward, middle location and downward inclination;

2) Location of TMG in relation to basis of skull the plane;

3) Length of frontal cranial fossae on which in the process of gnathometric research it is possible to define the individual norm of length of jaws bodies and existing deformation of sizes.

The innate variants of jaws location – we define according to the sizes of angles:

1) Facial.
2) Inclinational.
3) Horizontal.

1. Facial angle (F). We get it at crossing lines of N-Se and N-A (internal lower angle). The average size of facial angle is within the limits of 85 + 5º. His size characterizes the location of maxilla in relation to the skull basis: middle, displaced a little ahead in comparison with a face average (such location of jaws by Schwarz named "anteposition"), displaced a little back in comparison with a face average (this location of jaws Schwarz as named "retroposition").

2. Inclinational angle (I). It is created by of crossing of lines Pn and SpP (internal upper angle). The average size is 85 + 5º. If angle I is more than average, then the jaws are inclined ahead more than at an average face, that was the author named "anteinclination", if it is less, then jaws more inclined to back, this position is coned "retroinclination".

3. Angle of horizontal line (H) is created by crossing of lines H and Pn (internal upper angle). It determines the position of lower jaw head in relation to basis of skull that influences on the shape of face profile. In average this angle is 90º. According to Schwarz, there is interdependence of depth of middle cranial fossae and location of TMJ. The flatter the fossa is, the higher joints are, and vice versa.

With the change of orbital point (Or) location and arthral heads inclination plane H and size of H-Pn angle changes. If angle H is less than average, arthral heads are in position of "supraposition", closer to basis of skull, if it is more there, arthral heads are in position of "infraposition", below skull basis, than at an "average face". Inclination H plane combines with the change of outlines of face profile. At supraposition of arthral heads and normal development of lower jaw chin is displaced to the back, at infraposition – ahead. That is why supraposition of arthral heads influences on the form of jaw type, as retroinclination, and infraposition – as anteinclination of jaws.

As the form of lower jaw is concerned, here can be observed smoothing of chin location due to the change of growth of lower jaw ramus in length, changes of length of lower jaw base and size of its angles. The change of lower jaw form can hide the high or low location of TMJ that is defined by gnathometry.

Gnathometry:

On the basis of data analysis of gnathometry it is possible:

1) To define the anomalies of the dento-facial system, which developed as a result of disparity of jaws sizes (lengths of jaws body, height of lower jaw ramus), anomaly of teeth position and alveolar process shape;

2) To find out influence of sizes and location of jaws, as well as anomalies of teeth position on the shape of face profile;

3) To define the degree of occlusal plane inclination to the plane of skull basis, that it is important for the aesthetically beautiful prognosis of treatment.

For the conduction of gnathometryc analysis we use the following parameters:

1. Angle of Pn-OcP – (internal upper angle). By orientation on the position let 1st and 6th tooth (changeable bite) the average size of this angles more than by the orientation on the position of the 1st and 7th tooth (permanent bite). We choose the distal cusps of the last masticatory teeth located at central occlusion of a bite. If angles less than middle, then an occlusal plane is more up inclined in relation to skull basis, than at an "average face", and it influences on the aesthetically beautiful prognosis of treatment of sagittal anomalies of bite. In particular, by treatment of distal bite, when the angle of occlusal planes less than 75º, the displacement of lower jaw ahead is not very effective. It is due to the fact, that the chin is displaced ahead insufficient in relation to the line Pn. If angle is more than average, after treatment of distal or a mesial bite we can expect improvement of face profile;

a) Angle of SpP-OcP. During the orientation at teeth 1-6 it is less, than during the orientation on 1-7 teeth. This angle reflects the vertical location of frontal and lateral teeth.

b) Angle of OcP-MP. By orientation on teeth1-6, it is more than during the orientation at teeth 1-7.

2. Angle of Pn-MP is an internal upper angle. In average this angle is 65º. The size of this angle changes as a result of ante- and retroinclination of jaws, infra- and suprapositions of lower jaw arthral heads, and also at the anomalies of position or lower jaw development. By comparison of the craniometryc and gnathometryc measuring it is possible to determine the reason of this angle size changing.

3. A basal angle (B) is an angle of basis of jaws slope one to another (SpP-MP). Its characterized vertical position of jaws. It size is conditioned by the height of lateral teeth and size of mandibular angles. If this angle is more than average, the lateral areas of jaws are shortened, and the front ones are usually prolonged; the chin is displaced to the back, if this angle is less than average, there is an opposite correlation. The average size of angle is 20+ 5º.

4. Mandibular angle (G) is measured between the lines MT-1 and MT-2, e.g. by tangent to the lower edge of body of lower jaw and back surface of its branches. Its average size is 123 + 10º.

5. Angles of teeth inclination to maxilla to the plane SpP:

1 | 1 – Sp – 70º,

3 | 3 – Sp – 80º

4 | 4 – Sp – 90º.

The increasing of these angles sizes is marked at retrusion of upper incisors. It is characteristically for a mesial bite, underdevelopment of maxilla frontal area (shortening of frontal length, palatal position of incisors), and also at the cleft of maxilla. Diminishing of angles sizes is observed at the protrusion of upper incisors.

We distinguish 4 degrees of upper incisors protrusion by Horoshilkina (1976):

1 degree: is size of angle 1 | 1 – Sp – 56 – 61º;

2 degree – 51 – 56º;

3 degree – 46 – 51º;

4 degree – 41– 46º.

6. Angles of teeth inclination to lower jaw to the plane MP.

1 | 1 – MP – 85º,

3 | 3 – MP – 90º.

At the distal bite change of incisors inclination to the plane MP is poorly expressed. At a mesial bite the average size of this angle can increase.

6. Inter-incisors angle (I - i) this angle is created by the longitudinal axes of central incisors of upper and lower jaw. The average size is 120-140º.

The size of basal angle influences on the relation of incisors (B). If size of basal angle is 40º, then lower incisors seem to be inclined forward, an inter-incisors angle diminishes to 120 º and there is an impression of protrusion. Such protrusion Schwarz called a false one, when not only the relation of upper and lower incisors is changed but also their inclination to the plane of basis of jaws. The sagittal anomalies of bite are sometimes combined with pathology of vertical plane (by the open bite) and large size of basal angle B that can be conditioned by the genetic features of development. In such cases prognosis of apparatus treatment is unfavorable.

At the protrusion of upper incisors in connection with distal position of lower jaw (prognathic distal bite) the inter-incisors angle diminishes, and at mesial bite – it increases.

7. Angle of MM. The important value at cephalometric research has the angle of MM that is created by crossing of lines APg-SpP. When measuring this angle, it is possible to define the location of chin in relation to the apical base of maxilla (point A). Line APg characterizes position of the lower jaw body; and the locations of alveolar process is determined by the size of angle AB-SpP. Equality of angles of APg-SpP and AB-SpP testifies to identical position of body and alveolar process of lower jaw in relation to the plane of basis of skull.

At the alveolar form of distal bite the line A-B on cephalometric is behind the line A-Pg. For differential diagnostics of alveolar process development anomalies and anomalies of lower jaw position we use a difference in the size of angles of APg-SpP and AB-SpP.

Study of linear sizes:

1. Determination of length of lower jaw body:

N – Se + 3 mm = average length of lower jaw body, jaw 68+3 mm in a variable bite and 68 + 6 mm in a permanent bite.

2. Ratio of maxilla basis length toward length of skull front basis is 7:10. Length of maxilla basis is measured from the intersection of perpendicular from a point A to SpP and to the point of PNS.

3. Ratio of lower jaw base length toward length of upper jaw base at orthognathic bite is 3 : 2.

4. Ratio of lower jaw body length toward length of its ramus is 7:5. Length of lower jaw body is measured from the intersection of perpendicular to the point Pg on the plane of MT-1 (tangent to the body of lower jaw) to the intersection this line with tangent to the back surface of branches.

We measure the height of ramus from point-to-point crossing of MT-1 and MT-2 to point to crossing of MT-2 and plane of H.

The undevelopment of body and ramus of lower jaw in length results the form of lower face part supra position of arthral heads, and overdevelopment – as infraposition of.

5. Determination of width of ramus to lower jaw. For determination of degree of lower jaw ramus development it is necessary to take into account their width. The width of lower jaw ramus by Schwarz is 2/5 to the length of jaw body.

Profilomhetry enables to explore the form of face profile, define and specify the following:

1. Influence of craniomhetryc correlations on the form of type of person.
2. True face profile.
3. Peculiarities jaw profile that violates harmony of face (position of lips, chin, subnasal point, etc.).

At the profilomhetryc analysis of lateral cephalometric by Schwarz suggests to study the form of jaw profile by:

1. Position of lips in relation to the lines Pn and Po and to mouth tangent (line T), that connects the skin points of sn and pg.
2. Proportion of the face parts.
3. Profile angle T.
4. Taking into account the thickness of face soft tissues.

The field of jaw profile after Schwarz (KPF) is between the lines Pn and Po (nasal and orbital planes). In the jaw profile field Schwarz defines three parts of face: frontal (overhead) from the point of trichion (tr) at the edge of hairy part of the head to the point nasion (n) on a skin in the area of nose bridge; nasal or middle – from point nasion (n) to subnasale (sn); jaw (lower) from point subnasale (sn) to gnation (gn) on the chin.

Proportion of the face is defined by correlation of its jaw and nasal parts (comparison in relation to nasal or middle), and also by width of biometrical profile field (a middle size is 15 mm). Jaw part can be a little bit more or less nasal one (within the limits of 10%).

Positions of lips determine according their attitude toward the line T – mouth tangent, which connects the skinning points of sn – pg. If this line divides the red framing of upper lip in half and runs into the external surface of the red framing of lower lip, positions of lips are called middle. If one or both lips are situated in one plane midposition, such position is called positive, if after the plane negative.

Position of lips in relation to the nasal plane, of Drejfus (Pn). In a norm the upper lip touches the line Pn, the lower lip doesn't touch line Pn (it lacks 2-3 mm) and the chin is between the lines Pn and Po.

The intersection of Line Pn and Po forms the angle T that is called profile angle. Its average size is 10º. At such size of angle T profile is ideal in the aesthetically beautiful relation according to Schwarz and is named straight. At the size of profile angle more than 100 the type of profile is named sloped back, less than 100 – sloped forward.

At small variability of sizes T angle harmony face features is violated insignificantly, but its expression changes. The increase of profile angle gives the face the tenderness, and decrease expression of energy and courage.

The size of profile angle T characterizes position of the chin in relation to subnasal point (sn) and determines the form of jaw profile, and consequently matters at planning of treatment at sagittal anomalies of bite.

The form of profile depends on the thickness of soft tissues. In the region (n-N) it is 6 mm in the average (true for a child and an adult), and in the region of sn-A – for children its size is 12-14 mm, and for adults – 15-17 mm, i.e. the considerable increase of thickness is observed.

At the location of sn at the front mark Pn the distance is marked with a sign plus (+), at the location behind with minus (-). The thickness of soft fabrics in the region of point of pogonion (pg) matters too.

The location of lips, influences on the form of profile. A lip angle is created by the tangent connecting the most protruding points of lips with a nasal line. If this angle equals zero, both lips are on the same level, if it is situated to the left of nasal line it is considered negative, if situated to the right – positive.

The form forehead influences also the form of profile (vertical, protuberant or flat). The form of forehead matters for estimation of length of front basis of skull. As we know, the distance N – Se grows up to the age of 9 in average according to Schwarz it makes 70 mm, for boys of 13 years – 73 mm, for girls of 13 years – 67 mm.

On the basis of cephalometric research information by Schwarz came to the conclusion, that it is possible to define, what is according kind of face profile is typical for, that is typical for this individual in accordance with skull formation.

If a patient has the size of angles I and H is more or less than average, then the difference between the average size of these angles and that is of a patient is added to the average size of profile angle T.

$T = 10 + (Ii - In) + (Hi – Hn)$, where Ii is the size of patient inclination angle a; In is the normal size of angle of inclination; Hi is the size of angle of horizontal line at a patient; Hn is the normal size of angle of horizontal line.