The theme of the class № 3

The individual teeth position anomalies

The content of the topic:

Attempts to systematize different forms of pathology and single them out into isolated nosologic units have been observed already at the early stages of orthodontics development. The first deformations classifications are referred to the beginning of the 19th century. They are built by the principle of detecting regular and irregular position of individual teeth. These classifications character reflects peculiar to that time therapy methods, which came only to the treatment of position anomalies of individual teeth. Kingsley's classification (1836), described by the author in the work *Crookedly Standing Teeth,* is a good example: Kingsley differentiated general crooked teeth position, characterized by dental arches position, and partial irregular position of individual teeth.

Accumulation of clinical data concerning the etiology and pathogenesis of dento-gnathic anomalies, determination of the variants of dento-gnathic apparatus structure allowed focusing attention on the correlations of not only frontal, but also lateral teeth at normal and pathological occlusion. Thus, Angle (1889), except for occlusion anomalies, singled out seven types of position anomalies of individual teeth:

1) labial or buccal occlusion;
2) lingual occlusion;
3) medial occlusion;
4) posterior occlusion;
5) torsion occlusion;
6) infraocclusion;
7) supraocclusion.

The diagnostics of anomalies, built on the principle of dento-gnathic apparatus development deviations from the development of facial skeleton bones in three mutually perpendicular planes – orbital, Frankfort, and sagittal – was offered by Simon in 1919. The classification is based on investigations and has been viewed in coordinate system.

According to Simon, if an individual tooth is deviated, it stands:

1) outside of the normal dental arch;
2) in the middle of the normal dental arch;
3) medially from its normal place;
4) distally from its normal place;
5) above its normal place;
6) in its place, but rotated:
   a) around the long axis (the vertical axis of the head);
   b) around the transverse axis (of the head); the torsion point lies: near the apex, tooth neck, cutting edge (of the mastication surface);
   c) around the sagittal axis; the torsion point lies: by the apex, tooth neck, cutting edge (of the mastication surface).

The usage of Simon's classification in practical work is very complicated because of the terminology and patients' examination complexity.

I.L. Zlotnik's classification (1952) was built on the basis of a couple of factors (etiological, morphological, and functional). This is actually one of the first attempts of proceeding to descriptive diagnosis. The author singles out, together with jaw development and occlusion anomalies, irregular position of individual teeth.

A.I. Betelman's classification (1956) became a further step to dento-gnathic anomalies systematization. The author viewed the anomalies of teeth position and occlusion in three directions: sagittal, vertical, and transversal.

Position anomalies of individual teeth are classified depending on their location in the dental arch or outside of it. The anomalies of teeth location outside the dental arch include oral and vestibular; anomalies in the dental arch – supraocclusion and infraocclusion, medial or posterior occlusion, tooth torsion, diastems and teeth congestion.

D.A. Kalvelis (1957) built his classification on the basis of morphological changes taking into account etiology and deviations meaning for functioning and esthetics.

Position anomalies of individual teeth are reflected in the chapter on dental arches anomalies and are referred to the deviations of dental arches formation:

1. Anomalous position of individual teeth:

a) labiobuccal position of teeth;
b) palatoglossal position of teeth;
c) medial position of teeth;
d) distal position of teeth;
e) low position of teeth (infraocclusion);
f) high position of teeth (supraocclusion);
g) tooth rotation around the longitudinal axis (torsion anomaly);
h) transposition (teeth change places);
i) diastems and diaereses between teeth;
j) compact teeth position (congestion).

2. Upper canine teeth allotopia.

V.Y. Kurliandskyi (1957) offered a morphological classification, the first chapter of which gives the symptoms of teeth position anomalies:

- torsion;
- dislocation in the vestibular or oral direction;
- dislocation in the mesial or distal direction;
- violation of the tooth crown location height in the dental arch.

F.Y. Khoroshilkina and Y.M. Malyhin differentiate such teeth position anomalies relative to three mutually perpendicular planes:

In the transversal direction:

1) medial or lateral position of frontal teeth;
2) vestibular or oral position of lateral teeth.

In the vertical direction:

1) supraposition of upper teeth or infraposition of lower teeth;
2) supraposition of lower teeth or infraposition of upper teeth.

In the sagittal direction:

1) protrusion or retrusion of frontal teeth;
2) medial or distal position of lateral teeth.

Besides, the authors differentiate:

1) tooth rotation around its longitudinal axis;
2) transposition — neighboring teeth exchange places.

The WHO anomalies classification (Geneva, 1968) in its systematization recommends viewing teeth position anomalies in a separate chapter and subdivide them into:

1) congestion (including roof-shape location);
2) dislocation;
3) torsion;
4) spaces between teeth (including diastema);
5) transposition.

It should be noted that neither classification satisfies science and practice. The diagnostics problem in orthodontic clinical practice has not been completely solved, therefore at the present stage it is expedient to prefer descriptive diagnosis, in which each classification may be used.

Position anomalies of individual teeth may be observed at the absence of other violations in the dentognathic apparatus, but more often they are combined with occlusion anomalies. In the period of temporary occlusion they are met rather rarely in comparison to transitional dentition and permanent occlusion.

Vestibular teeth position.

Outside the dental arch, vestibularly, there may come out both individual teeth and groups of teeth. Canine teeth and central incisors are located vestibularly most often. The vestibular position of upper canine teeth is often combined with palatine displacement of lateral incisors.

Etiologic agents may be:

- irregular follicle anlage;
- early extraction of milk teeth;
- nasal breathing disturbance;
- supplemental teeth;
- inadequacy of teeth crowns to the width of jaws apical basis;
- dental arches narrowing;
- milk molars change delay.

Canine teeth come out vestibularly because the germ of the upper 3rd tooth is located very high and somewhat upwards, the germ of the lower one – deep, and these teeth must take a long and complicated way for complete eruption. At the moment of their eruption space in the dental arch is not infrequently already taken by a premolar and a lateral incisor, therefore they take the vestibular position.

If space is absent in the dental arch for a tooth, erupted vestibularly, one acts differently, depending on the clinical presentation, teeth condition, patient's age, and also the presence or absence of space in the dental arch. It is possible to correct the vestibular position of teeth with the help of orthodontic appliances; appliances in combination with surgical preparation – teeth extraction; and also separately by means of surgical and orthopedic methods.

Vestibular teeth position treatment at the presence of space in the dental arch is conducted with the help of removable appliances: Kaniura-Doroshenko's device Schwarz' apparatus with a vestibular arch; Osadchyi's device; Aisenberg's device; Angle's sliding arch; bracket system.

The question concerning indications to dental arch dilation or indications to the extraction of anomalously located or some less valuable functionally and esthetically teeth is solved on the basis of thorough study of deformation peculiarities, occlusion type and dental arches form, patient's face profile taking into account the data of the anthropomorphic measurements of control jaws models, roentgenograms.

At 25 % space deficiency it is possible to create dental arch dilation with the help of Koffin's loop, different types of screws, teeth transfer distally or medially, torsion anomalies treatment.

At space deficiency of 50 % and more of the width of anomalously located tooth crown there arises the question about extracting this or another less valuable tooth. In case permanent occlusion is formed and incisors articulation is established in stable equilibrium the anomalously located tooth is sometimes extracted. In cases when beside the vestibularly located tooth there is a destroyed tooth, the latter is extracted, and the vestibularly located teeth are transferred to the released space in orthodontic way.

To correct the vestibular position of canine teeth doctors more often resort to 1^{st} premolars extraction with subsequent canine teeth transfer into the dental arch.

Appliance choice depends on the position of the canine tooth root apex. There are three variants: root apex is deviated medially, distally, and along the middle of the treatment of retained canine teeth crown part. Depending on this, the point of force application for tooth transfer is located along the middle of the crown part, close to the clinical neck along the middle of the alveolar crest. With this purpose it is possible to use removable and fixed orthodontic appliances:

— Angle's arch, apparatus of A.I. Pozdniakova, K.A. Kalamkarova;

— V.S. Kurilenko's device with movable activators.

In cases when the question of extracting a lateral incisor for the purpose of correcting the anomaly of canine tooth position is solved, one should take into account not only the crown position but also its anatomic form.

The lateral incisor is also extracted when the canine tooth root is declined forward. After the extraction the canine tooth transfers into its place.

Not infrequently tooth extraction is combined with the corticotomy of the osseous septum and compact layer of bone in the region of the extracted tooth, in that way canine tooth transfer into the dental arch may be accelerated.

It is also possible to accelerate the orthodontic treatment of vestibular tooth position by means of surgical preparation – transaction of the alveolar process with a thin fissure drill in the vestibular-lingual direction on both sides of the transferred tooth. The alveolar process is to be perforated parallel to the transferred tooth root, at the maximal distance from it, not damaging the alveolar walls of the neighbouring teeth.

The vestibular teeth position may be corrected with the help of the prosthetic method. With this purpose teeth are devitalized, pivot stumps are made and covered with crowns (plastic, porcelain or combined).

Palatine teeth position

If teeth or a group of teeth come out on the palatine side on the upper jaw, they have the palatine position. It is the most characteristic of incisors and 2nd premolars.

Etiologic agents of the palatine position may be:

a) interincisor bone underdevelopment;
b) upper jaw anterior part narrowing;
c) alveolar process growth disturbance;
d) supplemental teeth;
e) premature milk teeth extraction;
f) bad habits;
g) nasal breathing disturbance;
h) upper lip, alveolar process, hard palate nonunion;
i) transitional dentition process violation;
j) irregular teeth germs anlage.

This anomaly may disturb lower jaw movement, distort speech.

Depending on the patient's age, anomaly form, and its clinical presentation different treatment methods are applied. The main clinical symptoms, playing an important role in the choice of treatment methods, are:

1) space presence (insufficient, absent);
2) lower teeth location (congestion, spaces, vestibular inclination);
3) the degree of upper teeth covering the lower ones (deep, medium, minimal or absent).

A.I. Betelman and A.S. Chernomordyk (1952) differentiate five groups of incisors palatine position: deep cover of the upper teeth with the lower ones, palatine position of the upper frontal teeth, normal development of the frontal part of the lower jaw and underdevelopment of its lateral parts.

Treatment. Schwarz' gum shield, Briickl's device, Bynin's gum shield;

1) medium cover of the upper teeth with the lower ones, palatine position of the upper frontal teeth, normal development of the frontal and lateral parts of the lower jaw.

Treatment Bynin's gum shield;

2) absence of cover or very insignificant cover of the upper teeth with the lower ones, palatine position of the upper frontal teeth.

Treatment stationary Angle's arch with the application of pull by means of ligature, Pozdniakova's device, Topel's device, bracket system;

3) palatine position of incisors, caused by the tight standing of the upper frontal teeth.

Treatment Schwarz' apparatus with a screw, elastic activators, occlusive side plates; bracket system;

4) palatine incisors position, caused not only by growth delay in the region of upper frontal teeth, but also by the excessive development of the frontal part of the jaw body with spaces present between the incisors.

Treatment orthodontic appliance on the upper jaw with occlusive side plates, a screw along the sagittal line or with elastic activators and on the lower jaw for its reduction in the same direction; orthodontic apparatus with a vestibular arch; Osadchyi's device; Aisenberg's device; Angle's sliding arch; bracket system.

Lingual teeth position.

The lingual position of individual teeth or groups of teeth may be met as separate anomalies or in combination with other teeth and dental arches anomalies. Especially often this happens to the lateral incisors. This is explained by the fact that these teeth follicles are normally located somewhat orally from the roots of the similar milk teeth. Later on, under the influence of jaws growth and tongue pressure, during eruption the teeth transfer vestibularly and take correct position in the dental arch. At lower jaw growth delay the 32^{nd} and 42^{nd} teeth remain in the lingual position. This anomaly may also arise at the premature extraction of milk teeth, because of milk teeth change delay, at the underdevelopment of the lower jaw apical basis, supplemental teeth presence, teeth medial shift.

Tight location of the lower frontal teeth reduces teeth resistance to cariosity, creates conditions for periodontitis development, dentogingival recesses formation.

The lingual location of the lateral teeth declares itself during their coming out. In this period it is possible to make a removable orthodontic appliance dilating the lower jaw, with a screw, a vestibular arch and elastic activators-pushers on an anomalously located tooth.

For the free transfer of the lateral incisors a milk canine tooth may be extracted. The space for permanent canine teeth later on will be created as a result of lower jaw growth at the expense of its future dilation or 1^{st} premolars extraction, or using orthodontic appliances for its sizes increase.

It is possible to use appliances disjoining occlusion, with screws and sectoral saw cuts: Andresen's apparatus, functionally acting Frankel's devices, device of P.S. Flis and G.P. Leonenko.

In older age in some cases at the lingual position of incisors with 50 % and more space reduction and at the absence of space in the dental arch teeth extraction is resorted to with subsequent orthodontic intervention for their correct arrangement in the dental arch. From the esthetic point of view it is expedient to extract the l^{st} premolars. It is also possible to extract one lower incisor. At congestion, arising as a result of apical basis reduction, it is the best to dilate the dental arches.

Obtained results are to be necessarily recorded after the treatment with the help of devices of removable or fixed construction.

Treatment prognosis is more favorable at teeth extraction and at the transfer of lingually located teeth with the help of instrument method.

Diastema.

Diastema is a space between the central incisors, more often met on the upper jaw.

Diastema may be caused by:

- bad habits;
- late extraction of milk teeth;
- anomalies of the lateral teeth form and size;
- partial adentia;
- anomalous position of the upper lip frenulum;
- supplemental teeth;
- inadequacy of teeth and jaws sizes (big jaws and small teeth).

There are differentiated two types of diastems: true and not true. Not true diastema arises in the period of transitional dentition and disappears after the eruption of the lateral incisors and canine teeth. True diastema arises as a result of the penetration of the upper lip frenulum connective tissue fibers into the median suture.

On the grounds of clinical examination, study of the roentgenogram of the incisors and alveolar process region, taking into account etiologic and pathogenetic agents F.Y. Khoroshilkina (1962) offered diastema types classification.

The first type of diastema is lateral deviation of the central incisors crowns at the correct location of their roots apices. This type of diastema is not infrequently caused by supplemental teeth, whose eruption was preceded by central incisors eruption, bad habits, fingers and tongue sucking.

The second type is corpus, lateral dislocation of incisors. It may be caused by lateral incisors adentia, bony tissue induration along the median suture, low attachment of the upper lip frenulum, distal position of an incisor, a canine tooth, or their allotopia. This type is not infrequently a hereditary trait. Kantorowich, Korkhaus call this diastema a true one, thus emphasizing its difference from the diastema arising under the influence of etiologic agents.

The third type is medial inclination of the central incisors crowns and lateral deviation of their roots. Such diastema takes place at the presence of supplemental teeth between the central incisors roots or of a supplemental tooth located across at odontoma, multiple cysts adentia.

At diastema the central incisors crowns location may be different:

1) without axis rotation;
2) with rotation around the axis of the medial surface in the vestibular direction;
3) with rotation around the axis of the medial surface in the oral direction.

Such varieties of the central incisors position are met at all diastema types.

In clinical practice there are sometimes observed asymmetrically located diastems. In such cases the diastema is formed not because of the asymmetrical position of both similar teeth relative to the lip frenulum, but because of diastems location on one side.

Spaces between teeth not infrequently lead to speech violations (lisping), whistle appears at speaking loud and consonants pronunciation. Diastems, violating dental arch continuity, reduce its endurance, and lead to periodontopathies

development. Diastems treatment is to be begun after the roentgenography of the region of central incisors and alveolar processes, joining them, with the purpose of detecting the location of the incisors roots and crowns, interalveolar septum width and density, finding supplemental teeth to determine the reasons for diastema formation.

Diastema may be treated by orthodontic and complex (surgical-orthodontic, orthodontic-prosthetic, therapeutic) methods.

Orthodontic treatment may be conducted with the help of removable and fixed appliances.

Appliance choice depends on the diastema type. Action force will be at the different height from the scalprum: at the first type – closer to the cutting edge, at the second – near the clinical neck, at the third – along the middle of the alveolar process.

At insignificant diastema it is possible to use thread ligature, which gives positive results.

Among fixed appliances Korkhaus' apparatus may be used: for this purpose orthodontic crowns or rings with vertical bars soldered to the medial edge for rubber rings attaching are put onto the teeth, subject to transfer.

It is also possible to:

- glue orthodontic buttons onto the vestibular surfaces of central teeth with the following attachment of rubber rings;
- use Begg's apparatus, Babaskin's apparatus;
- use modern fixed orthodontic appliances – bracket system.

Removable appliances:

1) Kalvelis' apparatus with a hand-like elastic activator;
2) Schwarz' apparatus with a vestibular arch and an elastic process;
3) Kurylenko's apparatus with a movable activator and rubber recoil.

During diastema treatment surgical interventions are not infrequent – supplemental teeth extraction, upper lip frenulum plastic surgery, destruction of the bony septa between the central incisors sockets, checkerboarded compact osteotomy. These operations promote diastema self-regulation and facilitate orthodontic treatment.

If diastema appeared because of lateral incisors adentia, after central teeth approachment dental arch defect is compensated with fixed dentures with support on the upper canine teeth.

Teeth torsions (torsion anomaly).

Teeth torsions are the most unfavorable anomalies of teeth position. Most often it happens to the incisors, canine teeth, and premolars on both jaws. Turned round teeth may be located in the dental arch and outside it. Rotation degree may be different – from a couple of degrees to 90° and even 180°.

There is differentiated frontal axis torsion anomaly, when the crown is inclined labially or palatally, and sagittal axis torsion – the crown is inclined medially or distally.

The anomaly may be caused by:

- irregular permanent tooth germ anlage;

- premature milk tooth extraction with subsequent medial dislocation of distal teeth;
- supplemental teeth;
- a retained tooth;
- dental arches narrowing and lack of space in the dental arch for individual teeth;
- macrodontia.

Patients with this anomaly often complain of esthetics violation.

When an orthodontic appliance is being chosen for torsion treatment the following factors are taken into account:

1) longitudinal axis rotation degree;
2) presence, lack or absence of space in the dental arch, necessary for the establishment of the rotated tooth in correct position;
3) degree of rotated tooth root formation.

Torsions treatment is referred to complicated orthodontic interventions, as it is accompanied not only by mechanical tension of the periodontal tissues (interdental ligaments, periodontal fibers), but also by resorption of the alveolus bony tissue, root cement.

The treatment is usually conducted with mechanically acting appliances, removable or fixed, applying two counteractive forces.

Fixed appliances:

- a crown or a ring with a soldered bushing onto the rotated tooth in combination with an elastic or stationary Angle's arch (depending on the presence of space in the dental arch);
- crowns with bushings, hooks, rubber recoil;
- edgewise technique;
- Z.S. Vasylenko's apparatus (1967) with a removable elastic lever.

Removable appliance:

- a removable plate with a vestibular arch and counteractive forces (vestibulararch and appliance basis).

Surgical methods.

Teeth rotation may be accelerated with the help of a surgical method, which consists in the change of a chronic injury with an acute injury. The main surgical intervention at this anomaly is quick tooth rotation (redressement force) (P. Forshar, 1732).

Semiluxation: under anesthesia the tooth is rotated by force with the surgical forceps into correct position, and then splinted by the well-known technique. In 60 % cases this method ends with tooth extraction, as during rotation the neurovascular bundle is damaged and the tissues dye off. A.A. Pohodina (1955) has worked out indications to this method:

- the tooth root must be absolutely straight;
- presence of space in the dental arch;
- patient's age (formed root).

Complete dislocation: the rotated tooth is extracted, the root canal is filled, a tooth is immediately implanted.

Instrument surgical method.

Teeth torsions treatment with orthodontic appliances with preliminary surgical intervention in the periodontal fissure was offered by S.I. Kryshtab, A.D. Mukhina, Z.F. Vasylevska, and P.V. Khodorovych in 1974. At that, the neurovascular bundle is preserved! The method consists in the following: at first an orthodontic appliance is made, then under anesthesia the periodontal fibers are dissected with a sharp thin chisel by 5–7 mm depth, the tooth is rotated with the surgical forceps and splinted with the following establishment of the orthodontic appliance. 5–7 mm is enough for the formation of a muff of the connective tissue around the root to keep the tooth in correct position.

Combined method (surgical-orthodontic).

At big deficit or complete absence of space in the dental arch teeth torsions are treated by means of the combined method. The less valuable tooth is extracted, and the position of the rotated tooth is corrected with orthodontic appliances.

After treating tooth torsion the acting device is to be replaced with a retention one.

As this anomaly has an inclination to recurrences, the retention device should be prepared earlier, and the tooth is to be kept in the new position for a long period of time.

Prosthetic method.

At considerable torsion of teeth their position may be corrected by means of prosthetics. With this purpose the tooth is prepared and covered with an artificial crown. In complicated cases teeth are depulped, the crown part is cut to the gums, and a stump side plate is prepared, covered with a plastic, porcelain or combined crown. To stimulate teeth torsions finger massage, vibration influence with the help of special crown forceps, and different physiotherapeutic procedures (electrophoresis) are used.

Supraocclusion and infraocclusion

Teeth position in the vertical direction is detected in accordance with the occlusal plane.

Infraocclusion is such a deformation, at which a tooth or a group of teeth on the upper or lower jaw do not reach the occlusal plane. By clinical presentation infraocclusion is close to dental half-retention. At that, the crown part of the tooth is completely erupted, but the alveolar process is underdeveloped in this part.

Supraocclusion of one or a couple of teeth is characterized by teeth crossing the occlusal plane level.

Supraocclusion (or infraocclusion) is observed at the curvature of the dental or alveolar arches in the vertical direction, at deep, open bite, dento-gnathic lengthening.

Space present, infraocclusion is treated by means of pulling the teeth with the help of removable devices of mechanical action (Angle’s apparatus with elastic arches along the vertical line, rings, crowns with hooks and rubber recoil between them). If there is no place in the dental arch, it is previously dilated.

When treating supraocclusion, appliances with biting plates or occlusive side plates are used, on which fast-hardening plastic is applied.

The prognosis of treating infra- and supraocclusion considerably depends on the correctness of conducting retention and periods of occlusion height establishment.

Teeth transposition

Teeth transposition is a reciprocal exchange of teeth places in the dental arch. For example: a canine tooth in the place of a lateral incisor, and the lateral incisor in the place of the canine tooth. The anomaly is caused by irregular teeth germs anlage. The treatment should be planned after studying roentgenograms. The choice of treatment method – surgical (individual teeth extraction), orthodontic, or orthopedic – depends on the degree of their dislocation and roots inclination.

The teeth, which have come out outside the dental arch and are turned round with the help of orthodontic appliances, should be put into the dental arch. Esthetic defects can be eliminated by means of restoration or prosthetics. At distal transposition of the upper permanent canine tooth and the delay of temporary canine tooth change it is possible to extract the temporary tooth and transfer the 1^{st} premolar to its place, having put a canine tooth between premolars.

For orthodontic treatment there are used removable plates with screws, elastic activators, vestibular arches, and fixed orthodontic appliances: the arches of Angle, Mershon, Begg, bracket system. Orthopedic treatment consists in the change of the teeth crowns form by the method of prosthetics using artificial crowns.