1. **Examination of the patient in the orthodontic clinic: external examination, examination of the oral cavity, temporomandibular joint**.

Visual inspection

During a general examination, the somatic and mental development of the patient and their suitability for age are determined; Pay attention to the patient’s height and weight, constitution.

The patient is examined from the front, in profile, from the back and the following is determined:

- position of the head, shoulders, shoulder blades, legs (curvature of the legs, feet);

- the shape of the chest, abdomen, back - curvature of the spine;

When examining the head you must:

- determine its proportionality to body size;

- proportionality of the facial and brain regions;

- face shape.

Face shape.

The shape of the face can resemble the shape of a circle, square, rhombus, truncated cone, oval, triangle, hexagon. The face can be narrow, wide or medium width; shortened, medium length, elongated. The shape of the face profile can be convex, straight, flattened, concave. Typically, during an orthodontic examination, the face is divided into three relatively proportional parts:

- upper (frontal), middle (nasal), lower (maxillary).

The upper part starts from the hairline and ends in the middle of the line that connects the eyebrows. Middle - continues from the middle of the line of the superciliary arches to the subnasal point connecting the lower edges of the wings of the nose; lower - from the subnasal point to the lower point of the chin. Only the middle part of the face (nasal) has relatively stable vertical dimensions. The height of the upper part of the face (frontal) depends on the hairline and hair retention. The height of the lower part depends on the type of bite in the vertical and sagittal planes - with a deep bite it can be reduced; with open and mesial – increased.

Oral Osmtor

• Color, moisture content, CO integrity

• The degree of atrophy of the alveolar processes, the shape of the alveolar arches

 • Size, color, moisture content of the tongue, condition of the papillae

• Lip frenulum

Examinations of the temporomandibular joints. X-ray: OPTG (gives a general idea of the joint), CBCT, MRI.

1. **X-ray method of examining an orthodontic patient (study of an orthopantomogram).**

Indications for OPTG. Drawing up a treatment plan. If there is no improvement. After treatment until the retention period. We do not do it for children under 6 years old. Sight shot.

Orthopantomography - panoramic tomography was developed by Paatero (1958) for layer-by-layer planar imaging of the spherical contours of the maxillofacial skeleton. OPG is divided into 5 topographic areas and considered separately:

1. naso-maxillary region (zygomatic bone, maxillary sinus, nasal septum, palate)
2. dento-alveolar region of the HF (alvus process, teeth)
3. 3. dento-alveolar region of the LF (alvus part, teeth)
4. region of the LF (body, branch, symphysis, mandibular canal)
5. region of the TMJ

Anatomical review.

1. teeth: number of teeth (absence of rudiments, hypodontia, supernumerary teeth), abnormalities in tooth shape, stages of mineralization, apical changes.

2. bone: bone destruction, marginal periodontium

3. sinuses

4. symmetry

5. fillings, crowns

6. TMJ

7. mandibular canal

When analyzing radiographs, it is necessary to remember that the image is magnified 1.8 - 2 times.

1. **Photo protocol as an integral part of the management of an orthodontic patient. Analysis of photographs in orthodontics.**

To study the configuration of the face, the orthodontist uses frontal and profile photographs before and after treatment. Viewed from the front, they have diagnostic value in cases of narrowing of the jaws, pronounced protrusion of the anterior part of the upper dentition, with a deep or open bite, in cases of facial asymmetry, and malocclusion.

Patients are photographed in 3 projections: full face with closed lips, full face with open lips but teeth closed in the central occlusion, and profile. When looking forward, the head is positioned straight so that the imaginary sagittal and orbital planes are perpendicular to the floor of the photo booth, and the Frankfurt horizontal is parallel to it. The lips and chin muscles should not be tense. In order to compare and study photographs, identity is necessary.

Therefore, using photostats (make it possible to photograph patients at the same distance from the lens and at the same position of the head.

For a more detailed study of the face in profile photographs, the following is carried out: 1. Frankfurt horizontal (from the external tragus of the ear to the lower infraorbital margin)

2. orbital line (Simon's line, the line through the orbital point intersects the apex of the upper canine)

3. Dreyfus line (perpendicular from the nasion point to the Frankfurt horizontal)

4. Kantarovich's profile vertical (from the glabella - between the eyebrows, down), the last lines are parallel to each other and perpendicular Frankfurt horizontal line.

To transfer these lines, you need to mark these points on the skin with a pencil or stick paper circles.

**4) X-ray method of examining an orthodontic patient (CBCT study).**

In orthodontics, CBCT scans provide a high-quality three-dimensional image of the bite and the position of all teeth to accurately predict their movement and alignment.

A computed tomography scan is also necessary in case of dental anomalies (dystopic, supernumerary, impacted teeth). Similar anomalies can also be detected when taking a traditional panoramic image. However, there is one important nuance that must be taken into account. For example, when a dystopic unit erupts, the entire dental arch moves. That is why it is extremely important to understand the trajectory of tooth growth, as well as assess the need for its removal. Only a CT scan can provide this information.

During dental treatment aimed at correcting the bite, not only the dental crowns are “moved”, but also the roots. For this reason, it is necessary to have information about exactly how the latter will behave after completion of treatment in order to subsequently avoid any complications. The distance of the bone to the cortical plate is also measured using CT to take into account the movement of a particular tooth

Problems with nasal breathing (sinusitis, deviated nasal septum, polyps in the maxillary sinuses, overgrowth of adenoids, allergic rhinitis) are one of the common causes of malocclusion. In this case, CT makes it possible to assess the width of the nose, pharynx and larynx.

**5) Anthropometric method for studying diagnostic models of jaws (studying the shape of dental arches - Pon, Korchhaus index, symmetroscopy).**

Korkhouse Index

Determines the length of the anterior segment on the upper and lower jaws. The “reference width” of the upper dentition in the premolar area is divided by two and the standard length of the anterior segment of the upper jaw is obtained. Next, the length of the anterior segment is measured directly from the patient and the results are compared.

The length of the anterior segment on the lower jaw is -2 of the “reference length” on the upper jaw.

Pon Index

Allows you to determine the relationship between the sum of the width of the crowns of the four upper incisors and the width of the dentition in the area of premolars and molars. We obtain the required width of the dentition specifically for a given patient as a “standard” and compare it with the width that the patient directly has. This index helps us understand whether there is a narrowing or expansion of the dentition of the upper or lower jaw.

Symmetroscopy.

This method allows you to study the location of teeth in the transversal and sagittal directions. Orthocross (orthodontic cross) is used for express diagnostics. It is a transparent plate on which a cross with millimeter divisions or a millimeter grid with divisions of 1 or 2 mm is applied. It is applied to the model of the upper jaw, the cross is oriented along the median palatal suture, and the location of the teeth in relation to the midline and transverse lines is studied. Using a symmetroscope, it is possible to study jaw models with greater accuracy, since the designs of these devices allow you to orient the jaw model, rigidly fix it and reproduce a similar position during a control study.

1. **Anthropometric method for studying diagnostic models of jaws (correspondence of tooth sizes - Tonn, Bolton index).**

 Bolton index

This method in orthodontics is recommended exclusively for adults in whom the growth of the cranial bones has already completed, as well as the development of the dentofacial apparatus. It is suitable for identifying the exact location of the violation and allows you to assess the need to grind off the enamel from the vestibule of the mouth. To do this, identify the disproportion of the width of the crowns in the anterior section in relation to other sections.

The author proposed two main indicators:

• Index “anterior ratio” – the ratio of the mesiodistal sum of the widths of the incisors and canines. Normally it is 77.2%.

• “overall ratio” index – the ratio of the width of all teeth of both arches from the first molar to the first molar. Normally, it should not exceed 91.3%.

 Index ton

When assessing the Tone index, only the 4 upper and 4 lower incisors are measured. We need this index to measure the proportionality of the permanent incisors. The basis is the ratio of the sum of the four incisors of the upper jaw to the sum of the four incisors of the lower jaw. Thanks to this method, we can identify a discrepancy in the size of the patient’s permanent incisors and make a decision in favor of separation (reducing the width of the tooth) or restoration of teeth (increasing the width of the tooth)

Tonn index - ratio of the sizes of the upper and lower incisors with an orthognathic bite = 1.35.

1. **Anthropometric method for studying diagnostic models of jaws. Methods for determining the lack of space in the dentition.**

Used to analyze the lower dentition Merry Field and identify method lack of space for teeth in anterior portion of the lower jaw.

1. Using Measurement a caliper, algorithm: measure the width of the lower incisors and canines in the and sum to the equator area.
2. Draw a tangent gingival margin of the first premolar and canine on each side of the jaw respectively.
3. We find the most convex mesial contact point of the crown of the first premolar and lower the perpendicular to the tangent (left and right). We get two points on the gum between the canine аnd premolar.
4. Using a ligature wire, measure the length of the anterior part distance between points and we get of the lower jaw along the gingival margin.
5. From the length of the anterior part of the lower jaw subtract the sum of the width of the lower incisors

Normal: the resulting number should be and canines. be O. If the resulting value is negative, then there is a shortage of space for teeth in an anterior region of the lower jaw

**Nance method (longitudinal length)** used to determine the lack of space in the dentition.

Measurement algorithm:

 1. Using a caliper, measure the width of 12 teeth (from the first permanent molar of one side to the first permanent molar of the opposite side).

 2. We determine the length of the existing dentition with a piece of ligature wire from the distal edge of the permanent molar of one side to the distal edge of the molar of the opposite side, while on the lateral teeth we place the wire in the middle of the chewing surfaces, and on the teeth of the anterior group along the incisal edge. The wire is laid without taking into account teeth located outside the dentition.

Normally: the first and second dimensions are equal. If there is a difference between the measurements, we can talk about a deficiency or excess of space in the dentition.

 There are 3 degrees of shortening of the dentition:

 1st degree: reduction in the length of the dental arch along the occlusal plane from 1 to 5 mm

 2nd degree: reduction in the length of the dental arch along the occlusal plane to 7 mm

 3rd degree: reduction in the length of the dental arch along the occlusal plane by more than 7 mm

Little's technique

The method is carried out to diagnose a lack of space in the anterior part of the lower dentition in order to study changes in the spatial position of the teeth.

 The method is based on the fact that the incisors of the lower jaw have the greatest width in the area of the cutting edge, which is due to their natural anatomical shape.

 Measurement algorithm:

 1. Using a caliper, measure the width of the crowns of the four lower incisors between the contact points and add them up.

 2. We measure the width of the crowns of the lower incisors along their cutting edge and add them up.

 3. From the sum of the width of the teeth along the cutting edge, subtract the sum of the width of the teeth at the contact points.

 Normal: the resulting number should be 0, which means no changes in the spatial position of the teeth. A negative value means that there is a lack of space for the incisors in the alveolar arch and a change in the position of the mandibular incisors in the dentition.

This technique can also be used to diagnose pathology in the teeth of the upper jaw.

**8. Anthropometric method for studying diagnostic models of jaws (measurement of the apical base of the jaws according to Snagina's method).**

The method is used to determine indications for dentition expansion and removal individual teeth.

Apical base of the - conditional line passing at the level of the apex of the roots on the upper and lower. jaws. Dimensions in transversal (width) and sagittal (length) directions. Using this method, it is possible to calculate the ratio between the sum of the widths of 12 permanent teeth (from 16 up to 26) and:

1. The width of the dental arch between premolars and molars at Pon points

Width of apical base

Length of the apical base

Width of the dental arch between premolars and molars at Pon points

Measurement algorithm:

1. Determine the sum of the width of 12 teeth in the upper or lower jaw. There sulting number is taken as 100%
2. Measure the actual width of the dentition in the area of premolars and molars.
3. Multiply the resulting width of the dentition in the area of premolars and molars by 100% and divide equal to the width of 12 teeth. We get the value in %

Normal: the width of the dental arch between the first premolars is 39.2% of the sum of the teeth and width width 12 between the first molars 50.4%. On the lower jaw the indicators are are 44.3% and 56.2%, respectively.

Apical base width

Measurement algoritm:

1. Determine the sum of width 12 teeth on the upper or lower. The resulting number is taken as 100%.
2. Measure the width of the apical base between the tips of the canines and first premolars at 8 mm below the edge of the gum. We multiply the resulting width of the apical base by 100% and divide by the sum of the width of 12 teeth.

We get the value in %.

Normal: the width of the apical base of the upper jaw is 44%, of the sum of the width 12 teeth, and on the lower jaw 43%.

Apical base length

Measurement algorithm:

1. Determine the sum of the width of 12 teeth in theupperor lower jaw. The resulting number is taken as 100%.
2. Measure the length of the apical base along the midline from the contact point of the central incisors onesonthepalatalside tothe intersection with the line between the distal surfaces of the first of permanent molars.
3. We multiply the resulting length of the apical base by 100% and divide.by the sum of the width of 12 teeth. We get the value in %.

Normally: the length of the apical base of the upper jaw is 39% of the sum of the width of 12 permanent teeth, and in the lower jaw it is 40%.

Degrees of narrowing of the apical base with close position of the teeth

* 1 degree: you can count on expansion or lengthening of the dentition and growth of the apical basis under the influence of orthodontic equipment. upper jaw width 42-39%; low jaw 41-38%.
* 2 degree: removal of individual teeth is indicated in order to eliminate the discrepancy between the sizes of the dental arch and its apical base.

Expansion is contraindicated, as this will worsen the disproportion between the size and width of the apical base. Upper jaw width 39-32%; low jaw 38-34%. Upper jaw length 35-26%; low jaw 36-31%.

**9. Functional methods of study in orthodontics (determination of chewing efficiency according to Rubinov, Gelman).**

*Gelman chewing sample*

In 1932, S.E. Gelman modified the Christiansen chewing sample. According to the Gelman method, the chewing efficiency is determined by time, namely 50 seconds give the patient 5 almond kernels for chewing. After 50 seconds, he spits the chewed almonds into a cooked cup, rinses his mouth with boiled water. 8-10 drops of 5% sulima solution are added to the same cup and filtered through gauze wipes. The remaining almonds on the wipes are placed in a water bath for drying, after which the dried particles are removed from the wipes and sieved through a sieve. If all is sieved = 100% chewing efficiency.If a residue is present in the sieve, it is weighed and the percentage of loss of chewing efficiency, i.e. the determination of the residue to the entire weight of the chewing sample, is determined by proportion. (For example, if 1.2 g remains in the sieve, the percentage of loss of chewing efficiency is 5: 100-1.2: x; x = (100-1.2): 5 = 24%.)

*Rubinov chewing sample*

The sample proposed by I. S. Rubinov in 1957 is called a physiological chewing sample, since chewing continues until the appearance of a swallowing reflex. According to the method of I. S. Rubinov, the chewing efficiency is judged by the chewing time of 0.8 g of hazelnut. Period of chewing before swallowing = 14s on average. When a swallowing reflex appears, the mass is collected in a cup, and then according to Gelman.

**10. Functional methods of study in orthodontics (electromyography, myotonometry).**

*Electromyography*

Electromyography is a method of functional examination of the muscle system that allows their biopotentials to be graphically recorded. Registration of biopotentials allows you to determine the condition and functionality of different tissues.

Electromyography (4 sensors: 2 per temple, 2 per jaw angle chewing muscle) - recording of the change in biopotentials occurring in the muscles at the moment of excitation. With the help of electromyography, the functional state of the superficial muscles of the face (mimic, temporal, chewing and supra-lingual) is studied.

Electromyography is carried out using special devices - electromyographs. The study results are recorded as electromyograms (EMG).

electrodes are fixed in two ways:

1. cutaneous, when thin plates are superimposed on the muscle under study;

2. needle when a small needle is inserted into the muscle. This method is more informative, although it causes a little unpleasant sensations.

Electromyography allows you to identify the cause of the anomaly (if it is due to disorders of the function of the muscles of the UFO), choose the design of the apparatus, a set of myohymnastic exercises and determine the duration of the relational period.

It is desirable to record the activity of paired muscles at: 1) physiological rest; 2) stress, including at compression of dental rows; 3) various movements of the lower jaw.

*Myotonometry*

Tone of chewing and mimic muscles is measured with myotonometer. In case of abnormal muscle tone changes. The device for measuring the tone of chewing muscles consists of a probe and a scale for measuring in grams. By myotonometry, it is possible to determine the tone of the chewing muscles in a state of physiological rest and with maximum volitional closure of the dentition, and it is also possible to judge the ability of the neuromuscular system to develop muscle tension during contraction. In order to identify the relationship between the tone of the chewing muscles themselves and the strength developed by them, a combination of myotonometry and gnatodynamometry was used. The subject was offered to squeeze the sensor of the electronic gnatodynamometer with a certain force with his teeth, while the muscle tone was measured with a myotonometer. The study found that muscle tone does not increase strictly in proportion to the force developed.

**11. Dental prosthetics in children with milk bite, replaceable bite in case of early loss of primary teeth and tooth destruction (indications, types of prostheses and technique).**

Indications for prostheses in children.

1. Simplicity of structures (a child cannot sit in a chair for a long time).

2. Hygienicity

3. Esthetics

4. Restoring Chewing Function

5. Prevention of gastrointestinal diseases, zuboalvelolar movement.

6. Do not interfere with jaw growth (elasticity and sliding mechanisms). Hh grows due to sutures (incisional and median palatine). Nh due to the angle, lateral departments. The jaw grows when the formation of milk teeth begins and distems and tremas appear between the teeth.

*Temporary bite period.*

1) Seal, crown. We do not use tabs (expensive, long), only seals. Standard crowns steel 3em, thickness 0.15mm. Plastic crowns. We prepare the tooth for stamping. In milk teeth, the equator is at the level of the neck, preparation is tooth therapy. Orthodontic separation - elastic separation rings between teeth. You can remove the print only from the tooth. We change the surface of the crown. We cut the edge of the crown according to the model. We fix it on permanent cement. Observation 1 year/six months so that it is not cemented. (Teeth fall out with crowns, used from 1 year to 12 years).

Indications for prosthetics with standard crowns of milk teeth. 1. severe destruction of milk teeth (caries).

2. malformations of tooth tissues

3. tooth injury (chipping, breaking of the crown).

4. Pathological erasability

2) Apparatus for preventing tooth row deformities after tooth removal.

A) To preserve the interval between the teeth, consisting of an orthodontic azonasube ring and a loop soldered to the crown.

B) a non-removable dental prosthesis with a sliding mechanism. Strut. 3) prosthetics with a high-frequency plate prosthesis with chamber fixation. Meet all requirements. Once every 6 months relocation. 1 change every two years. Children don't wear at night. Only when they eat. Clammer Adams on molars, in the front department - clammer-simple bent. Sea orthodontic apparatus with artificial teeth. The prosthetic apparatus is used all the time, but we remove it for food, it will break when eating. We introduce a screw with trammers and relocation once every six months is not needed. A complete removable device, if there is no dairy. Making like adults. The boundaries are the same. It needs to be remade often.

*Dental prosthetics in children with a replaceable bite*.

For milk teeth, we use the above types of prostheses. Permanent teeth.

We look at the root. If the root is formed - temporary crowns. If the root is formed - an artificial crown based on an artificial stump. 2 years formation of the root and 2 years closure of the top. Orthodontic apparatus with artificial teeth, screw, diastem spring. Until the formation was completed and the top was closed - prosthetics with temporary structures. Ring and seal on top. Tabs. All-ceramic crowns after apex formation. A bridge-shaped sliding prosthesis along the ilina-Marcosian, when we know that the tooth will not cut out permanently, we are waiting 18 years for implantation. Removable device with a screw for two teeth, a screw between them and preserving space between the teeth. Small saddle-shaped prostheses. Removable elastic prostheses for upper jaw.

**12. Classification of orthodontic devices:**

1. according to the principle of operation: mechanical, functional, combined;

2. by type of support: stationary or interactive;

3. by location: intraoral and extraoral;

4. by type of fixation: removable, non-removable, combined;

5. at the place of operation: single-jawed, double-jawed, extra-oral;

6. according to the device: cap, arc, elastic, frame, block.

**13. Non-oral devices used to treat anomalies of the dental system:**

- head, (frontal-occipital, parietal-occipital, combined),

- cervical,

- maxillary (maxillary, mandibular, chin, submandibular, at the corners of the lower jaw),

- combined.

Facial arches. They are produced by the factory method. They are more often used in the form of two soldered arcs – a toothed and an extra-toothed one. The extraoral part of the facial arch is made of orthodontic wire with a diameter of 1.8 mm, intraoral with a diameter of 1.0; 1.15 and 1.3 mm. The length of the facial arch ranges from 83 to 111 mm. Depending on the length of the arc, three sizes are available: large, medium and small.

The facial arch consists of three sections: the middle one – intraoral, which is contoured according to the shape of the frontal section of the dental arch, and two lateral ones – extraoral, curved according to the shape of the face, and ending with two hooks for applying extraoral traction. The intraoral part of the facial arch is inserted into the tubes of the intraoral apparatus (removable – mouthguards or non–removable - into tubes on rings). Depending on the purpose of treatment, the middle (intraoral area) of the facial arch may or may not be adjacent to the front teeth. In the middle, both arcs must be welded together. The sliding of the intraoral part of the facial arch is limited by clamping locks, U-loops or bayonet bends.

**14. Orthodontic devices of mechanical type of action. Examples of devices, indications for use.**

• Mechanical devices are characterized by the fact that their strength (pressure exerted on problem areas) is inherent in the design itself and does not depend on the contractile abilities of the chewing muscle structures.

The force comes from the active part of the device and is regulated by: the elasticity of the arc and the spring; the elasticity of the rods and other fasteners, including screws. To create a certain pressure force on the problem area of the jaw, a specialist creates reference points and a force zone during the design of the device. It is important that the reference point is stable in comparison with the area of the dental system where the movement is planned. This way it is possible to move individual elements or a group of them.

Maxillary:

• Coffin spring systems. A plate base with a bent spring, made in a rounded, pear-shaped or oval shape with two fixing appendages. Pathology is corrected due to the springy properties of the orthodontic wire. The product is used for permanent, milk and replaceable bite in order to expand the RF arc and shift the elements in the mesio-distal direction.

• Devices with a standard screw. A plate base equipped with a screw. It is used for uniform expansion of the HF arc, elongation of the frontal zone and spreading of the jaw in the distal part.

• Plates with a fan-shaped screw. The device is used to evenly expand the frontal zone of the maxillary arch.

Devices for extending the woofer arc are structurally different from the devices described above:

• With a Coller spring – devices for unilateral or uniform stretching. The first option is represented by a sublingual clasp, a pair of semicircular bends of the spring and two appendages for fixation, the second by an apparatus with five semicircular bends of the spring. It is made of wire with a length of 1.3-1.4 cm and a diameter of 1-1.2 mm, bending so as not to touch the frenulum of the tongue. The ends of the spring are placed behind the distal border of the base along the alveolars.

• With a screw. The device with two guides on the woofer is placed above the frenulum of the tongue from the side of the alveolars. The cutting is performed vertically. When extending the mandibular arch, two screws are inserted into the device, located on both sides of the canines or I premolars. One cut is performed in the screw localization zone.

**15. Orthodontic devices of functional type of action. Examples of devices, indications for use.**

The source of force when using functionally active devices is the force of muscle contraction, which is transmitted through an inclined plane, a bite pad, occlusal pads, guide loops to the teeth being moved or the lower jaw. Such devices contribute to the restoration of the functions of the dental system.

Functional guide structures

Functional orthodontic devices with a guiding influence use their own contractile muscle strength as a source of strength and are used to restore and normalize the work of the dental system. These include:

• Inclined plane. This design changes the positions of the jaws relative to each other (changes the position of the lower jaw in the right direction), as well as separates the bite and promotes outward deviation of the teeth. Such a plane is made of metal or plastic, the width is selected depending on the number of teeth in need of correction.

• A snack area. It is used to correct bite defects in height (for example, to correct and eliminate such pathology as deep bite).

• Tilt-and-bite area. Combines the effects of the first two devices and is usually used to correct distal occlusion.

• Occlusal pads. They correct the height of the bite, perform the function of separating teeth, are used in the treatment of open frontal occlusion (smooth pads) and oral position of teeth or their groups (pads with prints of teeth antagonists).

Functional-functioning structures

This group of functional orthodontic devices includes buccal shields, guide loops and labial pelotes. Such constructions create the most favorable conditions for the normalization and correction of the functions of the oral cavity – chewing and swallowing, movements of the tongue, lips, breathing. In addition, they are designed to normalize muscle tone and muscle balance, provide normal conditions for the development of dentition and the formation of jaw bone tissue.

**16. Orthodontic devices of a combined type of action. Examples of devices, indications for use.**

Combined-action devices are involved in regulating the work of the muscles involved in chewing fragments of a food lump, and exert direct pressure on the dental units, forcing them to move.

The design of combined—action devices includes passive and active elements:

• arcs - oral and vestibular;

• expansion screws and springs;

• occlusal pads;

• inclined planes;

• Guide loops.

Depending on the type of malocclusion, combined devices are placed on one or both jaws.

Indications for the installation of combined orthodontic devices are distal, mesial, open and deep occlusions, as well as combined pathology.

The simplest devices of combined action are plates with a screw or springs and occlusal pads that separate the dentition.

The Bruckl–Reichenbach apparatus. It is a removable plate device for the upper jaw with a plastic base and an inclined plane in the frontal section, retaining clamps for 16 and 26 teeth, and a vestibular arch.

The device (mono block) of Andrezen-Goypl. It allows you to move the upper frontal teeth orally, expand the upper and lower dentition at the same time, perform dentoalveolar elongation in the area of the lateral teeth and move the lower jaw mesially.

Gulyaeva's device. The design of the device includes: supporting elements - crowns or rings on the first permanent molars of the upper jaw, auxiliary elements - bushings soldered horizontally to the crowns and hooks (open medially) soldered to the vestibular arch in the area between the canines and the first permanent premolars and folding hooks.

The device has three active elements: two of mechanical action (elastic traction as in the prototype – the sliding Engle arc and the vestibular retraction arc) and one of functional action – a metal stamped inclined plane located in the frontal section of the upper dentition.

The device allows you to move the lower frontal teeth vestibularly, the upper frontal teeth orally, thereby reducing the upper dentition, the lower jaw mesially (anteriorly). It can be used to treat prognostic bite.

The Khurgina device. The prototype of the device is a Katz bite plate. The device is a removable plate device for the upper jaw with a plate base and an inclined plane in the frontal section, retaining clamps for 16 and 26 (or 14, 24 teeth), an expanding screw and flip hooks thrown over the cutting edges of the upper incisors. Instead of an expanding screw, in some modifications of the device, an expanding Coffin spring is added.

The device is indicated for the treatment of prognathous occlusion, combined with protrusion of the upper frontal teeth, narrowing of the upper dentition.

The Bruckle apparatus. This is a removable plate device for the lower jaw, with a plastic base, retaining clamps on 36 and 46 teeth, a vestibular arch and a plastic inclined plane in the frontal section. A design feature of the basis of the Bruckl apparatus is that in the lateral section it fits snugly to the necks of the teeth, and in the frontal section it is located at some distance from the lingual surfaces of the lower incisors.

**17. Twin blocks (indications, design, application features):**

The twin block device is widely used in orthodontics. It is designed to correct abnormal occlusion in children aged 9-15 years. In this period, the design is most effective. This is due to the fact that the jaws are in an active phase of growth and development. At the same time, experts note that the need to wear this design is set individually and may be recommended at a later age.

Modern orthodontics often tends to choose this particular device, since it is characterized by easier adaptation of patients and high efficiency. It not only fixes the position of the jaws in the correct position, but also improves the profile of the face, reducing the increased load on the temporomandibular joints. Due to the absence of painful sensations while wearing the design, the probability of the patient refusing subsequent treatment is reduced, which is a guarantee of achieving the desired results.

The standard orthodontic device twin block (Clark's device) consists of the following parts:

• Base plates. This is the basis of the device, which has a direct effect on the gums and muscles. Due to the plates, incorrect occlusion is corrected. They are made individually, taking into account not only the specifics of pathology, but also the anatomical structure of the maxillofacial apparatus.

• Alignment arcs. They are made of metal, designed to set the base plates in motion. The equalizing arcs provide the required stress force, the level of which is adjusted by means of screws as treatment is carried out.

• Screws. They perform a fastening function, they are necessary to adjust and further control the required compression level of the plates. During the entire treatment period, specialists manually adjust the location of the screws.

The main indications and contraindications for the use of the design:

Specialists prescribe twin blocks (twin block) in order to correct malocclusion (in particular, with distal, mesial and open bite). Often, the device is resorted to in the presence of the following problems:

• sagittal gap of teeth between the upper and lower jaw;

• pronounced overlap of one incisor with another;

• incorrect inclination of some molars (both on the upper and lower jaw);

• lack of contact of teeth with each other (especially those that are localized in the central part).

The design is most effective in childhood and adolescence (up to 15 years old). It is rarely prescribed to adults, since the result will be weakly pronounced or completely absent.

The principle of correcting malocclusion is based on mechanical action on a certain area. At the same time, the impact must be constant and of a certain power load. Alignment arcs and screws in the plates help to achieve this. The correct direction is set directly by the orthodontist. Due to constant pressure, the structure of the jaws begins to change gradually: the teeth move in the right direction, twist into a normal state.

The duration of treatment is set individually. As a rule, therapy lasts about 6-12 months. During this period, the arc tension is periodically adjusted and the screw mechanism is corrected. These manipulations make it possible to achieve the most accurate impact on the required area.

**18. Preventive devices. Purpose, indications, types, features of application.**

1. Stoppi elastic band.

Children from 2 years of age with prolonged sucking of a pacifier or finger. Prevention of open bite. The plate shield is located between the teeth. Convenient jumpers for biting with side teeth. There is no material in the incisor area that prevents the growth of teeth.

2. The Muppy vestibular plate

is used in a milk bite (from 3 to 6 years old) and in a removable bite (from 6 to 8 years old).

1. The muppy-S vestibular plate.

Eliminates the laying of the tongue between the teeth, normalizes the closing of the lips. There are two types -soft silicone and hard plastic.

2. Vestibular plate with muppy-C visor.

When biting the visor, the woofer is pushed forward to the desired position. The plate can be worn with the visor up — the reverse incisor overlap is eliminated. There are two types – soft silicone and hard plastic.

3. The vestibular plate of muppy-G.

The flap does not allow you to put your tongue between your teeth.

4. Vestibular plate muppy-P.

The bead stimulates the tone of the tongue, keeps it in the correct position, helps children with speech defects.

3. Trainers.

1. Preorthodontic T4K (blue) – to eliminate bad habits, myofunctional disorders in children 6-10 years old.wear it every day for at least 1 hour plus all night.

2. Orthodontic trainer (pink) – to eliminate the emerging anomalies during he period of replacement bite.The final orthodontic trainer T4K (pink) is used in the next 6-12 months.

3. Trainer for adults (T4A —trainer for adults) — when 2 milk molars have erupted.

4. Trainer for braces (T4B — trainer for braces)— along with braces. 5. TMJ Trainer (TMJ — temporo-mandibular joint) - for the elimination of myofunctional disorders, prevention and early treatment of TMJ dysfunction.

4. Myobrace.

Myobrace Starter (MBS, myobrace starter): available in two models — the blue trainer is softer, the red one is more rigid. It is used to expand the dental arch. Trainers of this series do not have special cells for teeth. Contraindication – mesial bite.

Myobrace (Myobrace, frame series): to align teeth and correct occlusion in a removable and early permanent bite. In seven sizes. The orthodontist selects the size. The trainer has a rigid frame.

Myobrace No Core (MBN, frameless series): It is used as the main therapeutic device or as a retention trainer after orthodontic treatment. Available in 7 sizes, individually selected.

5. LM activator.

It refers to functionally active, vestibulo oral, double-jaw, mono block devices.

High trainer walls and recesses for teeth from the 1st premolar on one side to

1st premolar with the other on the treble and woofer. The lingual edges help to position the trainer on the woofer in the desired position. It has additional holes, which makes it possible to wear the device in case of respiratory dysfunction.Contraindication – mesial bite.

**19. Retention devices. Purpose, indications, types, features of application.**

They are used to consolidate the results of hardware treatment and prevent relapses. Their use is due to the fact that histological tissue rearrangements are slower than anatomical changes.

Alimova's classification.

1. Removable

-Howley retention plate

-a comprehensive retainer

-positioner

-aesthetic heat-stamped mouth guard

2. Non-removable

-composite splinting systems (Ribbond, fiber splint)

-reinforced retainer (Standard lingual multi-link retainer)

-lingual retainers on rings

3.alternative non-removable retainers

-bridges

- adhesive cast structures

Classification.

1. Active – the device design provides for the possibility of their activation:

• Covering the Main wedd

• Hawley retainer with aesthetic vestibular arch

• Bracket system with finishing arcs • Spring retainer.

2. Passive – not provided for activation.

Removable retention devices.

1. A plate with a plastic base and a vestibular arch.

Production.

Taking an impression. Marking the boundaries of the removable prosthesis base. Bending of wire elements. Production of a base made of plastic. Polymerization of plastic., polishing of the device. Disinfection of the device, packing in the ETC.

2. Retention mouth guard.

Removable functional device for stabilization and retention of the aligned dentition in the achieved position. This is a thin transparent polymer splint made according to a model that reflects the final result of orthodontic treatment.

Wearing a mouth guard ensures the formation of a full-fledged bone around the displaced teeth and the adaptation of the PR muscles to the new position of the dentition.

The retention period is individual, at least 1-2 periods of active orthodontic treatment (generally lifelong).

Production.

Alginate impression. Production of a working model from a supergypse. The model is cut so that the longitudinal axes of the incisors are perpendicular to the base of the model. According to the model, vacuum thermal stamping is carried out: 1) the blank plate is clamped into the frame and heated according to the instructions; 2) the heated plate is lowered onto the model, an area of reduced pressure is formed under the plate – the plastic tightly compresses the model. After the plastic cools, the mouth guard is cut taking into account the frenulum of the tongue, cheek cords, 2-3 mm above the necks of the teeth.

The apparatus of the Ministar. Bioplast plastic.

3. Osamu is a retainer.

A type of aesthetic retention device, proposed in 1980 by Osamu Yoshu.

The device consists of 2 layers.

1 layer – Bioplast plates 1.5 mm thick, they are soft and are an inner layer, allowing the device to adapt to the dentition, preserving the natural mobility of the teeth.

2 layer – ImprelonS plates 0.75 mm thick, they are rigid and are the outer layer, providing stable retention.

The Osami retainer is manufactured by thermal vacuum stamping.

First, the inner layer is stamped on the model. Then the Bioplast is cut from the occlusal surfaces. After that, the second layer is compressed. The retainer is cut along the borders.

4. The positioner.

This is a removable device consisting of two high-frequency and low-frequency mouthguards, rigidly connected to each other. Preserves the corrected bite, keeps the jaw in the correct position.

Disadvantages.

1. Due to the large size, it is difficult to wear for 24 hours.

2. Does not fix the incisors from tilt and rotation.

3. Increases the depth when wearing

4. there is a possibility of loosening of teeth due to the forces of muscle balance 5. it is contraindicated in case of violation of nasal breathing.

Advantages.

1. Maintain occlusal ratios and positions of teeth inside the mouth guard at the same time.

2. They are used for gum hyperplasia

3. Transparent, does not break

4. Stimulates tissue tone

5. Holds or changes the position of the teeth according to indications.

Non-removable retention devices.

Indications:

1. maintaining the position of the lower incisors in growing patients

2. saving space for further prosthetics

3. treatment of patients with periodontal diseases (the retainer here is a periodontal splint)

4. control of the closure of the three, diastem

5. After the treatment of the cramped position of the lower incisors. individual arc retainer

Removal of the alginate impression. Production of a working model from a supergypse. Flexing the retainer. You can make a silicone key. Preparation of the PR for fixing the retainer. Application of a liquid-flowing material to the retainer. Highlighting of the material.

An indirect method of fixation.

1. The retainer is fixed to the lingual surface of the teeth on the model with sticky wax.

2. The retainer is made of a silicone portable (transfer) key on the model

3. A liquid-flowing material is applied to the retainer in the key

4. The transfer is stored in the store and highlighted.

**20. The use of a rapid palatal expansion device**

Indications:

1. Symmetrical crossbite with narrowing of the upper dentition (skeletal shape);

2. Congenital defect of the maxillofacial region in adult patients;

3. Surgical and non-surgical pathology of the III class;

4. Lack of space in the upper dental arch in case of treatment without tooth extraction;

5. Respiratory problems caused by insufficient volume of the nasal cavity. Contraindications:

1. Asymmetric crossbite, when the goal is unilateral expansion;

2. The presence of a weak periodontal disease in the patient.

At the first stages of orthodontic treatment, when the upper dentition is expanded during the period of permanent bite, it is more advisable to use non-removable mechanical devices (with screws).

The Derichswiler device is more effective in patients with a skeletal form of narrowing of the upper dentition.

The Spring Jet – 2 orthodontic device is best used in patients with a dental alveolar form of narrowing of the upper dentition in order to slowly expand the palatine.

Clinical stages.

1. all diagnostic measures: survey, examination, study of organized crime, TRG, etc.

2. Installation of separation rings for 7-8 days.

3. remove the impression, cast the model, and make rings based on it. We select an orthodontic screw based on the clinical situation. The orthodontic screw consists of the screw itself and four wire appendages.

The pitch of the thread is how much the halves of the screw diverge when unscrewing by one turn (360 degree rotation).

The length of the screw is how far the upper dentition can be extended.

4. store the rings, remove the impression from them, and send them to the laboratory to attach the screw to the rings. The dental technician bends the screw appendages and welds them to the orthodontic rings. The technician welds the beams between the premolars and molars to combine the segment into one block.

5. The screw should be placed in the depth of the sky so that the projection of its force vector passes in a plane at the level of the middle of the length of the roots of the upper teeth.

6. The rings of the palatine dilator are fixed to the teeth using dental cement.

1. **Etiology, pathogenesis, clinic of open bite. Classification and diagnosis of an open bite.**

An open bite is characterized by vertical dysocclusion of the upper and lower dentition in the area of the tooth group.

Etiology and pathogenesis:

- Heredity (for example, vertical growth type)

- Diseases of the mother during pregnancy

- Atypical position of the rudiments of the teeth

- Early loss of baby teeth

- Diseases of early childhood (for example, rickets). Bones become elastic and experience deformation from the influence of musculature. The lower jaw bends upwards under the action of the muscles that lift the lower jaw. And in the chin area, it bends down due to the pull of the muscles that lower the lower jaw. The upper jaw is squeezed laterally and pulled forward.

- Impaired function of the endocrine glands, mineral metabolism

- Shortened frenulum of the tongue, impaired function of the tongue

- Violation of nasal breathing (oral breathing)

- Impaired swallowing function (infantile type of swallowing)

- Incorrect position during sleep (sleeping with your head thrown back)

- Bad habits (laying various objects between

Classification:

By localization:

1) In the front section

2) In the lateral section (one- or two-sided, distally open, distally limited)

According to etiology:

1) True (rickety) – always in the anterior section.

2) False/traumatic (from bad habits)

Degree of severity:

grade 1 – vertical gap up to 5 mm, no contact in the area of the front teeth

Degree 2 – from 5 to 9 mm, lack of contact in the area of the front teeth and premolars

degree 3 – more than 9 mm, lack of contact in the area of the front teeth, premolars and first molars.

Diagnosis:

1. Survey, inspection.

2. Calculation of diagnostic models.

3. TRG and CBCT.

Dental alveolar shape – dental alveolar shortening in the area of the front teeth of the upper and lower jaw, dental alveolar elongation in the area of the lateral teeth.

Skeletal shape – the slope of the base of the upper jaw, the slope of the base of the lower jaw, an increase in the angle of the lower jaw, an increase in the branch of the lower jaw, an increase in the jaw angle.

Clinic:

Facial features.

- Elongated lower third of the face

- Half-open or open mouth

- Sloping chin

- Smoothed chin and nasolabial folds

- The lips don't close

- The upper lip is shortened, flaccid

- Lips close under tension

- A symptom of a thimble (indentation on the chin as a result of overexertion of the circular muscle of the mouth)

Dental signs.

- The absence of contact of the front or side teeth with the antagonist teeth, the presence of a gap of various sizes between them

- The shape of the slit can repeat the position of the object being laid

- Tilt of the teeth (protrusion)

- Narrowing of the upper jaw, Gothic palate

- The scalloped cutting edges, premature abrasion of teeth that close are preserved.

**22. Features of the treatment of various forms of open bite in milk, removable and permanent bite.**

The period of milk bite.

The most important thing is to eliminate bad habits.

Consultation with an otorhinolaryngologist to normalize breathing.

Myogymnastics (to normalize the position of the tongue, restore the tone of the circular muscle)

Vestibular plate with tongue flap / with bead.

Pre-orthodontic trainer (the device is double-jawed and prevents the tongue from laying between the teeth when swallowing, since teeth and lips must be kept closed to keep it in the oral cavity)

The period of replacement bite.

LM – activator (the device operates on the same principle as the trainer)

Removable plate device with tongue flap and vestibular arch (tongue padding is eliminated and incisor tilt changes).

Removable plate device with a hole in the base of the tongue device (the tongue must fall into this hole and remember its correct position)

The period of constant bite.

A bracket system with inter-jaw elastic traction.

A bracket system with microimplants (if the position on one jaw suits)

The facial arch with vertical traction (the inner part of the device is fixed on the tubes of the orthodontic rings of the first upper permanent molars and, due to vertical traction to the head cap, ensures the restructuring of the lateral teeth and rotation of the entire upper jaw) – it is used for open bite caused by inclination of the upper jaw.

The bracket system in combination with maxillofacial surgery (if necessary, change the position and tilt of the upper jaw).

23, 24 – lecture

**25 Deep bite is a vertical anomaly of occlusion, characterized by an increase in the overlap of the lower incisors with the upper ones by more than a third of the height of their crowns and a violation of the cutting-tubercle contact.**

**ETIOLOGY**

The formation of a deep bite can be due to genetic, intrauterine and postpartum factors (common diseases, dental and maxillofacial pathology, bad habits).

Most often, a deep bite is inherited from parents along with the structural features of the maxillary systems and facial skeleton. Congenital facial deformities (such as "cleft mouth" and "cleft lip") also contribute to the development of a bite abnormality. Among prenatal factors, the most important are pregnant diseases, toxicoses, intrauterine infections, mechanical injuries, fetal hypoxia, multiplication, delayed intrauterine development, and so on.

Formation of deep occlusion in the postpartum period can be associated with hypotrophy, rickets and rickets-like diseases that negatively affect the growth and development of the child's bones; violation of the terms of teething and replacement of milk teeth; diseases of the gastrointestinal tract and ENT organs, etc. Deep bite often accompanies congenital and acquired defects of the musculoskeletal system: abnormalities in the development of the spine, congenital muscle crank, posture disorders, systemic diseases of the skeleton.

In some cases, deep bite has an etiological connection with early removal of milk or permanent molars, dental abnormalities: their size (macrodentia) and number (super complete teeth), abnormalities in the attachment of the tongue and lip bridle, the presence of diastema, multiple caries, partial adentia, pathological tooth erasability, injuries and osteomyelitis of the jaws, ankylosis TMJ

Among the bad habits that contribute to the occurrence of improper biting in children, long-term sucking of a dummy, sucking of a finger and various objects, biting of the lip.

**CLASSIFICATION**

According to the amount of overlap of the crowns of the central incisors in orthodontics, 3 degrees of malocclusion are distinguished:

 Grade I - floor from 1/3 to 2/3 of height (3-5 mm)

 II degree - overlap from 2/3 of the height to the whole crown (5-9 mm)

 III degree - overlap exceeds the crown value (more than 9 mm).

Depending on the position of the anterior upper teeth (vestibular or oral nature of the relationship of the frontal teeth), a roof-shaped and blocking form of deep bite is distinguished. The latter form is combined with prognathia. Deep distal and deep neutral bites are differentiated by interaction nature of lateral teeth.

**MANIFESTATIONS**

*The external manifestations* of deep bite are characteristic facial and oral signs. Facial manifestations include shortening of the lower third of the face, pronounced supramental fold, outward inversion of the lower lip. In general, the patient's face is sometimes characterized as "bird." The oral signs of deep occlusion include the overlap of the lower frontal teeth with the upper ones by the size of the crown, the predominance of the upper jaw over the lower one, a decrease in the depth of the oral cavity vestibule.

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**TREATMENT**

Treatment of deep biting in children must be started as early as possible. *During a temporary bite* (up to 5-6 years old), it is recommended to accustom the child to chewing solid food, fight bad habits (sucking a finger and toys, snacking a lip or cheek, etc.), perform myohymnasty. It is necessary to eliminate the factors contributing to the formation of a deep bite - the treatment of caries, the repair of the bridle of the lip and tongue, preventive prosthetics.

At the stage of *changing primary teeth permanently* (from 6 to 12-13 years), removable plates, trainers, activators (Andrezen-Goipl, LM-activator), Frenkel apparatus, Brückl apparatus, Bynin kappa.

Starting from the age of 12-16, the main method of treating deep bite is non-removable orthodontic devices - braces. In adults, orthodontic treatment of deep bite can be combined with surgical (compactosteotomy).

In case of persistent speech disorders, the patient may need the help of a speech therapist.

**Pathogenesis**

In hereditary macrognathia, the upper jaw develops in large sizes. With age, the teeth of the lower jaw try to find interdental contact, extending upward, and can rest against the palate.

With hereditary microgenia, underdevelopment of the lower jaw occurs, which later leads to the extension of the lower front teeth upward. As a result, the teeth of the upper jaw cover the teeth of the lower jaw by more than 1/3, and sometimes hide them completely.

Hyper-cutting of the teeth of the upper jaw can occur due to biting of the lower lip in childhood or sucking of the thumb. Because of this, the upper teeth extend downward and greatly overlap the teeth of the lower jaw.

Understripping of the side teeth, their early loss or absence of the buds of the side teeth leads to a decrease in the height of the bite, which causes a stronger overlap of the lower front teeth and the appearance of a deep bite. Teething retardation may be associated with systemic diseases (rickets) or general growth retardation. The absence of tooth buds is an extremely rare phenomenon, most often due to heredity. Early loss of lateral teeth in 99% of cases is associated with caries and its complications.

The abrasiveness of the lateral teeth can be a consequence of teeth grinding (bruxism). In this case, the far teeth contact the tubercle into the tubercle, and not the tubercle into the fossa. This leads to a decrease in the bite and, accordingly, the extension of the front teeth

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Disorders of the musculoskeletal system lead to serious disorders throughout the body (a decrease in pulmonary function, the development of right ventricular insufficiency, neurological deficiency, etc.) and can cause the formation of a deep bite. For example, when the center of gravity moves forward, prerequisites are created for the formation of a deep bite. The proportional growth of the jaws is impaired and the upper one begins to protrude forward. In children, this is due to faster growth of the bones of the upper jaw, in adults due to the displacement of the lower jaw posteriorly.

Protrusion forward of the upper front teeth is due to the fact that there is too much load on the periodontal of the upper front teeth and they deviate forward. In the future, this can lead to severe bite disorders, up to the removal of the front teeth

**Clinical methods of examination:**

Survey. The basis of treatment planning is patient complaints. The task of the doctor at this stage is to correctly interpret the patient's complaints, which are often uncertain.

Visual inspection. The doctor examines the proportions of the face. After that, the dental rows in the closure are evaluated. The doctor should examine each tooth to detect signs of erasure, they can be seen on the chewing surfaces of the back teeth.

Assessment by photos. The doctor estimates the proportions of the face and dentition in a closed state from photographs taken from the left and right sides. Traditionally, dentists have paid little attention to facial analysis of the full face, focusing on facial changes in profile. In full-face photographs, changes in the lower and upper jaws are not so noticeable, especially when treating a deep bite. That is why before and after orthodontic treatment photographs are assessed in profile.

**Paraclinic examination methods**

Study of diagnostic models of jaws. The doctor takes casts from the jaws with a special mass. Then plaster models are cast, which can be studied.

Computed tomography (CBCT) and 3D cephalometry allow you to accurately determine the skeletal class, dimensions of the jaws and teeth, which helps to assess the severity of the disease, as well as accurately plan orthodontic treatment

telerentgenogram (TRG) of lateral projection of the skull. With this method, you can also recognize the skeletal class of the jaws and plan orthodontic treatment

**26) Features of the treatment of various forms of deep bite in the primary, mixed and permanent dentition.**

Treatment of deep bite in children should begin as early as possible. During the period of primary occlusion (up to 5-6 years), it is recommended to accustom the child to chewing solid food, fight bad habits (thumb sucking and toys, biting the lip or cheek, etc.), and perform myogymnastics. It is necessary to eliminate the factors that contribute to the formation of a deep bite - treatment of caries, plastic surgery of the frenulum of the lip and tongue, and preventive prosthetics.

 At the stage of replacement of primary teeth with permanent ones (from 6 to 12-13 years), removable plates, trainers, activators (Andresen-Goipl, LM-activator), Frenkel apparatus, Brückl apparatus, Bynin mouthguard, etc. can be used to separate the bite.

 Starting from 12-16 years of age, the main method of treating deep bites is fixed orthodontic devices - braces. In adults, orthodontic treatment of deep bite can be combined with surgical treatment (compactosteotomy).

For persistent speech impairments, the patient may require the help of a speech therapist.

27, 28 lecture

**29. Etiology, pathogenesis, clinic of crossbite. Classification and diagnosis of crossbite.**

Crossbite refers to transversal anomalies.

It is caused by a discrepancy between the transversal dimensions and shape of the dentition. The frequency of crossbite, according to the literature, varies at different ages: in children and adolescents - from 0.39 to 1.9%, in adults - about 3%.

Causes of crossbite

1. Congenital:

• genetic predisposition or heredity;

• viral or somatic diseases suffered by a pregnant woman during pregnancy;

• bad habits and unbalanced diet.

 2. Purchased:

• birth head injuries;

• injuries received in the first year of life;

• long-term use of pacifiers and nipples;

• the child's habit of sucking his finger or foreign objects such as toys, pens, etc.;

• habit of propping your cheek with your fist or palm.

Complications of crossbite:

1. Gastrointestinal diseases.

2. Defects in the placement of the tongue, lips and other parts of the face, which causes aesthetic discomfort and speech disorders.

Crossbite classification

• Lingual, in which the upper jaw expands and the lower jaw narrows. It can be observed on one side or both. It happens with or without displacement.

• Buccal – expansion of the lower jaw with a parallel narrowing of the upper. It may also have a displacement and be observed on one or both sides.

• Buccal-lingual – a combined type of occlusion that combines the characteristics of the previous two.

Diagnostics.

An orthodontic diagnosis is preceded by a complete clinical, functional and instrumental examination. During the initial consultation, the orthodontist examines the face and oral cavity, palpates and auscultates the TMJ, performs the necessary functional tests, and compares objective data with complaints and anamnestic information.

The further algorithm involves determining the constructive bite, making and analyzing diagnostic models of the jaws, study of orthopantomograms and direct teleroentgenograms of the head.

X-rays of the TMJ are required to detect displacement of the mandible during crossbite.

**30. Features of the treatment of various forms of crossbite in the primary, mixed and permanent dentition.**

In late temporary and mixed bite , hardware treatment using functional devices (bionator) is widely used

Janson, Frenkel function regulator, Klammt activator, Andresen-Goipl activator)

Janson Bionator



Frenkel function regulator



Klammt activator



Andresen-Goipl activator



With the formation of a permanent bite, treatment is carried out with fixed orthodontic devices of mechanical action: the Engle apparatus, Katz crowns, brace systems, followed by wearing retainers.

Engle's apparatus



Katz crown



**31. Types of bites. 6 keys of occlusion according to Andrews. Signs of orthognathic bite**.

BITE - the relationship of the dental arches in the position of central occlusion.

1) Physiological bite (full chewing function)

A) Orthognathic

• Each tooth intersects with two antagonists. One by one

antagonist have upper wisdom teeth and lower central

incisors.

• Each upper tooth intersects with the lower one of the same name and behind

standing, and each lower one - with the same upper one and the one in front.

• The upper front teeth overlap the lower ones by 1/3 of the crown height. The lower ones, with their cutting edges, contact the palatal surface of the upper ones.

• The midline between the central incisors of the upper and lower jaws coincides with the midline of the face.

• The buccal cusps of the upper lateral teeth are located outward from the same cusps of the lower teeth. Thus, the palatal cusps of the upper teeth are located in the longitudinal grooves of the lower teeth, and the lower buccal cusps are located in the longitudinal grooves of the upper teeth.

• The anterior buccal cusp of the upper first molar is located on the buccal side of the lower first molar in its transverse groove, between the buccal cusps

• The posterior buccal cusp of the 1st upper molar is located between the posterior buccal cusp of the same lower molar and the anterior buccal cusp of the 2nd lower molar.

• There are no spaces between the teeth in the dentition.

• The muscles that lift the mandible are in a state

uniform contraction.

• The mandibular head is located at the base of the posterior clivus

articular tubercle.

B) Straight (The front teeth are closed by the cutting edges, the lateral teeth are as in orthognathic; the front teeth are subject to wear)

C) Orthognathic bite with protrusion of the anterior teeth (Biprognathia) - the alveolar processes and anterior teeth are tilted forward, the lateral ones as in orthognathic.

D) Orthognathic bite with retrusion of the anterior teeth (Opisthognathic) - the alveolar processes and anterior teeth are tilted back, the lateral ones as in orthognathic.

E) Orthognathic bite with deep incisal overlap - the degree of overlap of the upper anterior teeth with the lower ones increases, but the cutting-tubercle contact is maintained. Lateral as in orthognathic bite. The incisal cusp contact is preserved

2) Pathological bite (impaired chewing and appearance):

A) Distal bite - the advancement of the upper front teeth forward. There is a gap between the upper and lower front teeth. The lower lip falls under the upper incisors. The lower front teeth can damage the mucous membrane. Anterior buccal tubercle 1st superior

The molar closes with the lower tubercle of the same name or falls on the groove between the second premolar and the first molar.

B) Mesial bite. The lower front teeth overlap the upper ones of the same name. The mesial buccal cusp of the upper first molar comes into contact with the distal buccal cusp of the lower first molar or the groove between the 1st and 2nd molars.

B) Deep bite. The upper front teeth completely overlap the lower front teeth, which can injure the teeth. Lateral as in orthognathic. No incisal-tubercle contact

Traumatic – injured by CO

D) Open bite (anterior, lateral). There is no closure of the front teeth, sometimes even the premolars.

D) Crossbite (unilateral - two types; bilateral - two types). The buccal tubercles of the lower lateral teeth are located outward from the upper ones of the same name, or are shifted to the lingual side.

6 keys according to Andrewson:

Key I - correct cusp-fissure contacts between the first molars of the upper and lower jaw with the correct inclination of the longitudinal axes of the teeth in the occlusal plane: medially - the buccal cusps of the first molars of the upper and lower jaws should be located in the intercuspal fissure of the molars of the lower jaw. The distal buccal cusps of the high molars should be in close contact with the distal buccal cusps of the first molars of the low and the mesial slope of the buccal cusps of the second molars of the low.

Key II - correct angulation in degrees (mediodistal inclination) of the longitudinal axes of the crowns of all teeth.

It is determined by the angle formed by the long axis of the clinical crown of the tooth and the line

perpendicular to the occlusal plane. Angulation is considered positive (positive) when the incisal part of the tooth crown is located more mesial than the gingival part. A negative (negative) angulation value is typical for teeth with a more mesial inclination of the tooth neck relative to the cutting edge. With normal occlusion, crown deviation indicators are always positive.

Key III - correct torque (vestibular-oral inclination of the crowns and roots) of the teeth. It is characterized by the size of the angle formed at the intersection of the tangent to the midline of the vestibular surface of the tooth crown and the perpendicular to the occlusal plane. With the normal position of the incisor crowns, their occlusal part is located more vestibular in relation to the gingival part. Normally, the lingual inclination of the occlusal part of the crowns of the lateral teeth of the upper dentition increases in the direction from the canines to the molars.

Key IV - teeth located in the dentition should not be rotated along the axis. The front teeth, rotated along the axis, take up less space in the dental arch, which leads to its flattening and shortening. Axially rotated premolars and molars take up more space in the dental arch, which contributes to its deformation and elongation and disruption of occlusion. When the tooth is rotated around a vertical axis (key IV), the length of the dental arch changes. If the front tooth located in the dental arch is rotated along the axis, the arch is flattened and shortened; if the lateral tooth is rotated, it lengthens, which disrupts the relationship of the dentition.

Key V - the presence of tight contacts between the teeth, each dentition without diastema and three.

Key VI - curve of Spee (sagittal occlusal curve) - this is an imaginary line from the distal cusps of the second molar to the cutting edge of the teeth (normally straight, range 0.5 mm)

**32) Prevention of dental anomalies. Devices used for the prevention of dental anomalies.**

Prevention is a set of individual, collective, and family measures to prevent diseases and preserve the health of the population.

Primary prevention is a set of government and social measures aimed at preventing the occurrence of dental diseases and provides for the improvement of dental health as a result of:

1) health education of the population on professional oral hygiene

2) development of nutrition programs aimed at improving the condition and diet

3) periodic examination of mouth cavity and disease prevention.

Secondary prevention is a set of measures aimed at changing the severity of dental anomalies and orthodontic treatment.

Tertiary prevention - restoration of partially or completely lost chewing function, speech articulation, aesthetics - orthopedic treatment.

Dental anomalies and deformities are significantly common in children, which is facilitated by various hereditary, congenital and acquired factors.

Reasons leading to the development of dentofacial anomalies and deformities:

• Hereditary factors

• Diseases of pregnant women

• General somatic diseases of the child

• Artificial feeding

• Caries

• Bad habits

• Abnormalities of the frenulum of the lips and tongue

• Impaired abrasion of hard dental tissues

• Upper respiratory tract diseases

Dysfunction of the dental system can be a consequence of dental anomalies and deformations. And they can cause anomalies.

Impaired nasal breathing appears in the form of nose blowing or mouth breathing. Causes:

• ENT diseases (deviated nasal septum, chronic rhinitis, adenoids)

• Functional deficiency of the orbicularis oris muscle

• Prematurity, complications during child birth

• Severe somatic diseases at an early age

• Anomalies of the frenulum of the upper lip

Swallowing dysfunction is caused by prolonged sucking of pacifiers, late inclusion of solid foods in the diet, late eruption of primary teeth, bad habits, and a short frenulum of the tongue.

Chewing dysfunction is manifested by sluggish chewing, the habit of chewing on one side or on the front teeth. Causes:

• Mouth breathing

• Late inclusion of hard foods in the diet

• Serious illnesses of the child

• Caries

• Disruption of the process of abrasion of hard dental tissues

• Edentia

Speech impairment occurs due to deformations of the palate, anomalies in the position of the teeth, a short frenulum of the tongue, and lips.

Devices, used for prevention:

1) Trainers

2) LM activator

3) Myobrace

4) Elastic plate Stoppi

5) vestibular plate Muppy

**33) Congenital malformations of the facial skeleton (clefts of the hard and soft palate, upper lip). Clinic, diagnostic, treatment.**

Clinical forms of congenital cleft palate

1. Congenital through clefts of the upper lip and palate:

a) one-sided:

- right-handed,

- left-handed.

b) bilateral

The cleft of the upper lip continues to the alveolar process and further to the hard and soft palates.

2. Congenital non-through cleft palate:

a) complete - non-closure of all layers of the soft and hard palate to the alveolar process, which is not changed in shape.

b) incomplete - cleft of all layers of the soft and partially hard palate.

3. Congenital hidden cleft palate. The nasal and oral mucosa are not damaged, but there is non-fusion of the muscular layer of the soft palate. Sucking is not impaired, diagnosed at the age of 4-5 years, and speech impairment - rhinophony. The purpose of the operation is to restore the direction of muscle fibers and connect the fragments to each other

The main stages of radical uranoplasty according to A.A. Limberg:

1. Refreshing the edges of the cleft.

2. Lateral incisions on the palate according to Langenbeck.

3. Incisions in the anterior palate according to Lvov for retrotransposition.

4. Detachment of mucoperiosteal flaps.

5. Dissection of the nasal mucosa along the posterior edge of the hard palate.

6. Resection of the posterointernal edge of the palatine foramen according to Limberg.

7. Incision for mesopharyngoconstriction according to Ernst and lateral detachment

walls of the mesopharynx.

8. Interlaminar osteotomy.

9. Suture of the edges of the cleft.

Functional disorders of congenital cleft palate:

1. Violation of the act of sucking - lack of negative pressure in oral cavity. 2. Violation of the act of swallowing - danger of getting into the respiratory tract and aspiration. 3. Impaired chewing function. 4. Breathing disorders: predominance of mouth breathing; violation of the calorific function of the nasal cavity; the vital capacity of the lungs and, above all, the inspiratory reserve volume are reduced; patients are more susceptible to colds of the upper respiratory tract. 5. Diseases of the nose, throat and ears occur more often than normal: the external nose is deformed in 70% of patients; changes in the anatomical structure of the nasal cavity in 82% of patients; impaired respiratory function of the nose in 44.5% of patients; inflammatory changes in the eardrum, obstruction of the Eustachian tubes, mesotympanitis in 82% of patients; hearing loss in 70% of patients.

Anatomical defects of cleft palate:

1. Presence of a cleft palate

2. Shortening of the soft palate

3. Expansion of the pharyngeal ring

Palate plastic surgery, according to A.A. Limberg, must be radical, i.e. simultaneously restore form and function. At the same time, it is desirable to perform the operation using low-traumatic methods that exclude intervention on the bones. The operation to eliminate congenital cleft palate is aimed at solving the following problems: restoring the correct position of the muscles of the soft palate, creating a sufficiently long velum, closing the defect, narrowing the oropharynx and nasopharynx. As a result of the operation, a velopharyngeal seal should be created that is as close as possible to normal.

Radical uranoplasty according to A.A. Limberg contains traumatic techniques: interlaminar osteotomy and mesopharyngoconstriction. Later methods according to L.E. Frolova, L.V. Kharkov, although they exclude bone dissections, do not allow them to completely solve the main problem of ranoplasty: creating a velopharyngeal seal as close as possible to normal.

Gentle urano plasty technique

Currently, a method of gentle uranoplasty has been created and is being carried out, which fully solves the problems of radical uranoplasty and is devoid of the negative properties of the above-mentioned methods.

The main principle of the operation is to simultaneously solve three complementary tasks: closing the defect, creating a long and active velum and narrowing the nasopharynx and oropharynx.

**34) There are an endless number of options for tooth movement, however, they can be divided into four main types: tilting, corpus movement, root movement and rotation**.

Tilting is a movement of the tooth in which the root of the tooth moves in the direction opposite to the side of the displacement of the crown, i.e. the tooth rotates around one point.

Body movement is a type of tooth movement where the apex of the root and the crown of the tooth move in the same direction over the same distance.

Changing the axial inclination of the tooth due to movement of the root apex while maintaining the position of the coronal part is called root movement.

Depending on the morphological and functional pathology, four degrees of severity of periodontal tissue transformations are determined (D. A. Kalvelis, 1961).

The first degree is characterized by a slight increase in pressure in the periodontium, as a result of which a balanced process of resorption and new formation of the alveolar wall occurs, and the tooth remains stable. Such conditions are created in cases where low pressure is applied.

The second degree is characterized by complete compression of the periodontium with impaired blood circulation, when the resorption process in this area cannot occur and occurs in areas of viable tissue (cavernous resorption). After resorbing the strangulated periodontium and alveolar wall, complete morphological and also functional restoration of the periodontium occurs.

The third degree is characterized by strangulation of the periodontium over a large area with impaired blood circulation, when not only the strangulated periodontium and alveolar wall, but also the root of the tooth are involved in the resorption process. If, during the restoration processes, the resorption lacunae in the tooth root are lined with cement and the periodontium is restored, then this final outcome can be considered as the restoration of the functional ability of the tooth, but with morphological defects.

The fourth degree of severity of tissue transformations is characterized by bone fusion of the tooth root with the alveolar wall. The mechanism of formation of this position is determined by compression of the periodontium over a large area with its complete infringement, when in the process of resorption not only the alveolar wall and the restrained periodontium, but also the hard tissues of the tooth are absorbed until canals form in the root of the tooth. Until the resorption process is completed, restoration processes occur simultaneously. Resorption lacunae on the tooth root are filled not with cement, but with bone tissue, and osteons are formed at the bone-cement boundary in place of the strangulated periodontium. As a result of such tissue transformations, bone fusion of the tooth root with the alveolar wall occurs.

**35) Types and characteristics of bracket systems. Indications and contraindications for the use of brackets.**

**1.According to the material of manufacture:**

**Metal Bracket system.** Systems made from medical steel are the most “democratic” in price, accessible to many. This factor, plus the reliability and durability of the structure, make metal bracket popular.

**Ceramic Bracket system.** Ceramics do not spoil the appearance of teeth, since such bracket are almost invisible on the teeth. They are practically no different from tooth enamel, but over time, under the influence of certain drinks (coffee, tea, red wines) and coloring spices, they may become slightly stained. Also, ceramic bracket are not sufficiently resistant to mechanical stress.

**Plastic Bracket system.** The first orthodontic system to compete with metal brackets. Aesthetically, plastic looks much better and is almost as invisible. However, there are also disadvantages: low strength, coloring under the influence of food and drink dyes. In this case, you can use colored brackets, but this is a matter of taste.

**Sapphire Bracket system.** The installation of sapphire brackets has virtually no effect on your appearance - they are transparent and almost invisible. Made from aluminum oxide. The main and main disadvantage for the widespread use of sapphire systems is their high cost. But the advantages - attractiveness, absence of allergic reactions, high strength and comfort while wearing make this type of system quite popular.

**Titanium Bracket system.** Absolutely safe biocompatible orthodontic structures. Robust, durable and reliable systems, recommended for allergy sufferers. A relative disadvantage is that they stand out on the surface of the teeth.

**Combined Bracket system.** Today, this is a successful, popular option in many respects. The doctor can install different types of systems, depending on the situation. For example, if the lower row of teeth is more crooked, metal brackets are installed on it, and a more attractive-looking structure is placed on the upper row.

**2.Types of Bracket system according to location on teeth:**

**Vestibular Bracket system .**Located on the visible outer part of the tooth. This type of bracket is the most popular among patients. A variety of materials are used to make external brackets - metal, ceramic, composite and aluminum oxide. When using this type of brackets, there is no negative effect on the teeth. A special orthodontic material is used to attach the structure to the surface of the teeth .

**Lingual Bracket system.** For many patients, the aesthetic side of the issue is of great importance: they are interested in installing the system in such a way that it is not visible. The problem is solved by using lingual (internal) brackets; they are fixed on the inside of the teeth and those around them cannot see them. If we talk about an aesthetic solution, then this is the best option.

**3.According to the method of fixation:**

**Ligature Bracket system.** The ligature system consists of a metal arch, the actual bracket and connecting individual elements. The effectiveness of classical models is based on the ligature - an element of the bracket system, which is a thin metal wire. These systems have a high degree of functionality, and in some cases, only the use of a ligature system can lead to the elimination of bite defects. If a ligature system has been chosen for treatment, then a mandatory monthly visit to the orthodontist is necessary.

**Ligature-free Bracket system.** Today, manufacturers of orthodontic systems have developed self-ligating (ligature-free) bracket for more comfortable treatment of patients. Due to the absence of ligatures on the locks, which are subject to deformation, visits to the orthodontist are reduced by one and a half to two times. Externally, the self-ligating design looks neater and more attractive. The size of the locks in these systems is slightly smaller than in conventional classic systems.

**Indications and contraindications for treatment with Bracket system:**

**Indications:**

1. Crooked teeth
2. Bite defects (congenital or acquired)
3. Anomalies in the formation of the dental system
4. Crowded teeth
5. Large interdental spaces (more than 1 mm)
6. Displacement of teeth after extraction

**Absolute contraindications:**

1. Osteoporosis
2. AIDS, HIV, tuberculosis
3. Oncology
4. Epilepsy
5. Mental illness
6. Severe pathologies of the heart and blood vessels

**Relative contraindications:**

1. Temporary bite (up to approximately 12 years of age)
2. Pregnancy
3. Any disease in the acute stage
4. Exacerbation of chronic diseases
5. Caries, other dental problems
6. Poor oral hygiene
7. Bruxism
8. Alcohol abuse
9. Drug addict

**36) Methods for positioning Bracket system. Direct and indirect fixation of the bracket system.**

**Positioning methods**

The clasps of the brackets are attached to the outer (vestibular) or inner (lingual) surfaces of the teeth using dental material. In addition to the requirements for fixing brackets regarding the characteristics of the patient’s dental structure, there are general rules for their positioning:

• The center points (intersection of the horizontal and vertical planes) of the tooth and bracket must be aligned.

• Compensatory height changes from the frontal units (incisors) to the posterior teeth, then to the canines, premolars and molars.

**Table by Thomas Pitts**. Dr. Pitts' positioning technology has one significant difference from other methods, so it deserves special attention. The main goal of positioning is not only to straighten teeth, but also to create a harmonious and attractive smile for the patient after treatment. Read also: Description of STB lingual Bracket system Not every person’s smile is attractive, even if she has perfectly straight teeth. Surprisingly, the attractiveness of a smile depends on the simple geometric relationships of certain elements of the face. Studies have shown that the most harmonious and attractive smile is one in which the line running along the edges of the front teeth of the upper row is parallel to the curve of the lower lip. Thus, the Thomas Pitts technique has two goals - straightening the teeth and creating the correct “smile arc”. The bracket positioning parameters that achieve these goals are presented in the table below. It is recommended to use a high-precision GPS-A positioner to measure and position brackets.

**Direct method**

The technique involves attaching each bracket separately in the following sequence: the surface of the teeth is marked to determine the intersection points of the vertical and horizontal lines. The resulting central points will be the center of the bracket groove. The advantages of this method are the absence of a lengthy preparation process (in addition to sanitizing the patient’s oral cavity).

The disadvantages of direct fixation include:

– risk of incorrect positioning, lack of treatment results. The result of positioning errors can be greater severity of bite defects;

– high degree of physical and emotional stress on the doctor;

– strict requirements for the experience and professionalism of the orthodontist.

**Indirect method**

Fixing brackets using this method involves a two-stage installation of the structure. First, the elements are attached to a plaster model, and then transferred via mouth guards into the patient’s oral cavity. Various technologies are used to make mouth guards (Class, Best, Top, Esipovich method, etc.). Their difference is in the details (the use of one or two fillings, moving into the oral cavity in one or two stages, etc.). The general principles of indirect bracket are as follows:

1. The clasps of brackets installed on a plaster model are coated with a special compound (based on acrylic, silicone). When hardened, the composition is transformed into a mouthguard with elements of an orthodontic structure.

2. After preparing the oral cavity and the base of the locks, the mouthguard is installed on the dentition, transferring the bracket to the teeth.

3. At the end of the pressing time, the mouth guard is removed.

As a result of the procedure, bracket are attached to the teeth in the position in which they were fixed on a plaster model from casts of the patient’s jaws. In some cases, the filling with bracket is cut to simplify the transfer procedure. The bulk of the orthodontist’s work with this method of fixation occurs in laboratory conditions.

Indirect bracket installation has the following advantages:

– predictability of treatment results;

– patient comfort, reduction of time in the dental chair;

– minimizing dental errors. The disadvantage of indirect fixation is the labor-intensive preparatory period, which takes place in a laboratory - making impressions, plaster models, aligners.

**37) Stages of treatment of anomalies of the dentofacial system using a brace system.**

**TREATMENT STEPS:**

**Orthodontist consultation**

At this stage, a preliminary assessment of the situation and treatment plan is carried out after the initial examination. A consultation is a detailed conversation with detailed explanations and demonstration of similar examples on the computer.

**Diagnostics**

This procedure is carried out after a consultation to obtain all the detailed information about the bite situation. World standards imply the following diagnostic data for treatment planning: two special x-rays (orthopantomogram, teleroentgenogram), photographs of the face and teeth, impressions and diagnostic plaster models of the dentition (or digital scanning of the teeth). All information received is analyzed, after which an optimal action plan is drawn up aimed at eliminating dental anomalies.

**Discussing a treatment plan for braces**

At this stage, the exact cost, goals and duration of wearing braces are agreed upon, and a contract is signed. The duration of the visit is 30–50 minutes.

**Installation of braces**

Installation of braces is one of the most important stages of orthodontic treatment. Already at the stage of diagnosis and drawing up a plan, the doctor selects the parameters of the mechanism that will most effectively contribute to achieving the optimal result. Braces are placed on the teeth in strictly defined positions to ensure proper operation of the system and effective position control.

**There are two methods of fixing braces:**

**1. Direct method. Suitable for labial (external) braces.** The doctor fixes the braces directly into the oral cavity. This method provides less precise fixation while the patient spends significantly more time in the chair. Installing braces on one jaw takes about an hour.

**2. Indirect fixation method.** It consists in the fact that the braces are first fixed on plaster models of the jaws, then a portable mouth guard is made, and with the help of the mouth guard they are put into the oral cavity. This method is suitable for vestibular and lingual (internal) braces. The indirect method provides more precise fixation and also saves time in the orthodontist's chair, since the longest part (positioning on the teeth) was done on a plaster model of the jaw, where the presence of the patient is not required. Installation takes about 20 minutes.

The braces are fixed to a special material similar to that from which fillings are made. In this case, the system is hermetically glued to the tooth, preventing plaque from accumulating. The process of fixing braces is absolutely painless.

After installation there will be a hygiene lesson. The doctor will also discuss all the restrictions associated specifically with your orthodontic mechanism.

The initial stages of treatment with braces are straightening the teeth. 8–12 months.

Alignment occurs through the installation of arcs. These are wires that are inserted into each bracket and connect all the teeth into a system. The initial arcs have “shape memory”. This means that no matter how we bend the wire, securing it in braces, it will tend to return to its original state, exerting a force. Under the influence of the forces exerted (light but constant), the teeth will begin to take their planned place.

Treatment begins with thin, light arches, gradually moving to thicker ones, which align even the most unruly teeth with several roots into the correct position. The average replacement frequency is about 2 months.

**Bite correction. It takes 3–24 months**

After the teeth straightening stage, bite correction begins. The duration depends on the initial clinical situation. If before starting treatment we had no serious complaints about the bite, then this stage can take 2-3 months. If we treat a severe form of the anomaly, then the correction can last about another year.

Work on the bite is carried out on the most rigid arches, which are installed after the leveling stage. They no longer have “shape memory”, but retain the already achieved position of the teeth, allowing for optimal closure of the upper and lower jaws.

At the stage of correcting the bite, we close the gaps from the extracted teeth, adjust the depth, and wear intermaxillary elastic bands (transparent elastic bands that are worn between the braces of the upper and lower jaw, helping them move).

**The final stage. It lasts 3–6 months**

After we have straightened your teeth and corrected your bite, you can begin the final stage of eliminating anomalies. On it, orthodontists need the help of the patient. This is due to the fact that the detailing of the position of the teeth is carried out using intermaxillary elastics, which must be used for 2–3 months. The efforts at the final stage of treatment are as important as all the previous months-long work. Because relatively frequent adjustments are required at this stage, intervals between visits are 1 month.

**Installation of retainers. Removing braces**

When all goals have been achieved, we are ready to remove the corrective structures. This is usually done in three visits:

1. Preparatory stage. Installation of permanent retainers. Special retaining wires are glued to the inner surface of the upper and lower front teeth. They are not visible to anyone, and addiction occurs in a couple of days. Duration of visit - up to an hour

2. Removing braces. This process can be slightly unpleasant, however, it only takes a couple of minutes. The most time will be spent on removing remaining glue and polishing the enamel. The procedure takes about 45 minutes.

3. Installation of a removable retention plate and photograph. The procedure lasts approximately 15 minutes.

**39) The use of additional equipment during orthodontic treatment using a brace system. The use of microimplants in the treatment of anomalies of the dental system.**

**Additional equipment:**

**Orthodontic buttons**

They can be called lingual, Nance's buttons. These are additional elements in the composition of braces. The connection to the arc is simple, without using a lock. The button is attached to the surface of the tooth and is used as a support for the alignment structure. Lingual buttons can be placed on the front or inner surface of the teeth. They further expand the “functionality” of the device - they allow you to act on the tooth simultaneously from both sides, eliminate strong rotation, etc. The buttons are small in size and have a smooth surface. They do not interfere with the patient, do not injure the mucous membranes, and can be installed in any part of the dentition.

**Palatal clasps**

They are used as an addition to braces, installed only on the upper jaw between the molars, and cover the palate. The device looks like an arc and can have a complex shape. The clasp acts on the molars, holding them in a given position or rotating them (if rotation needs to be removed). It can adjust the size and shape of the upper jaw, change the inclination of the teeth, and move them back or forward.

The main part of the clasp is a curved metal arc. At its ends there may be:

• 2 hooks (attached to two molars). These are Tseitlin or Gozhgarian arcs;

• 4 hooks (attached to four molars). Such clasps are called Quadrohelix devices; they can be supplied with additional spacers or springs.

The design of the palatal clasp may include plastic plates covering the palate and active screws. To secure the device more securely, Nance buttons can be used.

**Palatal expanders**

These are palatal expanders, the mechanism of action is similar to palatal clasps, but have a different design. The expander consists of two symmetrical arches, which are attached with hooks to the molars of the upper jaw. In the center of the sky they are connected by an active screw. When the screw is activated, the expander rests on the molars. It can be used to increase the width of the upper jaw (“widen” the palate), lengthen the dentition, and rotate the molars around their axis during rotation. Palatal expanders include Derichsweiler and Hyrex devices.

**Sander leveling arc**

Jasper Jumper, Distal Jet, etc. have a similar design. A leveling arc (or spring) is used in conjunction with a bracket system to reduce treatment time and increase its effectiveness. The spring does not cause discomfort, does not interfere with the mouth, and the patient quickly ceases to feel it. It is used to remove the tilt of the lateral teeth (congenital pathology or deformation of the dentition due to the loss of one or more teeth). The arc is attached on both sides: one end on the power element of the main structure, the other on the tooth, the tilt of which must be corrected. The force action of the arc is adjustable, ensuring smooth movement of the tooth to the correct position.

**Forsus device**

Used together with a brace system to correct distal occlusion. Restores the correct position of the jaws relative to each other. It is used for distal occlusion (the lower jaw is shifted back). Additionally enhances the corrective effect of braces. It looks like a spring with hooks at the ends. Attached in the area of the molars, it ensures simultaneous movement of the dentition: the upper one moves back, the lower one moves forward. The position of the lower jaw does not change.

The Forsus device is installed after the primary bite correction. Its shelf life is 4-6 months. The spring is placed in the side of the dentition and attached to the teeth of the upper and lower jaw. To install it on the molar of the upper jaw, a reinforced lock is used; on the lower jaw, it is hooked onto a power arc.

**Herbst apparatus**

Used for distal occlusion, affects the temporomandibular joint. Effective when the lower jaw is small and when the upper jaw moves forward strongly. The design consists of two hinges secured to the molars of the upper and lower dentition with steel rings. The device keeps the jaws in the correct position. The correction force is adjustable, making the correction safe and comfortable. The device looks massive, but does not get in the way in the mouth, and is easy to get used to. Can be used in conjunction with any brace systems. Does not complicate daily hygiene, does not affect diction, does not interfere with chewing food. The device is not visible after installation - it is located on the side of the jaw, behind the cheeks.

**Lip bumper**

It is made of thin wire and looks like an arc with rings at the ends. Rings are used to install the bumper on the supporting teeth. It runs along the lower or upper jaw from the outside. In the area of the incisors, the arch can be covered with a polymer cover so as not to injure the gums and teeth.

The lip bumper is used separately from braces either as a means of correcting minor malocclusions or during the retention period (to consolidate treatment results). Using the device reduces muscle load and protects against repeated curvature of teeth.

**Lingual arch**

Used separately from braces, installed on the inner surface of the teeth. Can be used to correct bite on the upper or lower jaw. It is made of metal, looks like an arc of complex shape with active springs. Attaches to abutment teeth using rings. Allows you to correct the expansion of the jaw and lengthening of the dentition with the appearance of increased interdental spaces, remove large interdental spaces, straighten the dentition when teeth are crowded, and remove curvature.

**Microimplants are miniature screws that are implanted into the patient's maxillary or mandibular bone.**

The cut thickness of the screw does not exceed 1.5 mm, and the length is 15 mm. They are made of titanium, with a pure substance content of 90-99.5%. Titanium is an inert metal that does not cause allergic reactions. Such products have a high safety profile and are not rejected. There is a thread along the entire length, thanks to which the screw is securely attached to the bone.

**PURPOSE OF USING MICROIMPLANTS**

Correction of pathological occlusion is possible due to the natural mobility of teeth. Braces provide constant, even pressure on the teeth, causing them to move in the desired direction. The entire dentition is involved in this process, because it is the one that serves as the support for the orthodontic arch. The axis of not only crooked teeth changes, but also that of straight teeth. This drawback can be eliminated using microimplantation. Screws placed at specific points serve as fixed fixation points for the teeth being corrected. This makes it possible to avoid displacement of even elements. This need arises more often if you need to straighten a small number of teeth.

**MICRO-IMPLANT INSTALLATION PROCEDURE**

The procedure is almost painless. Anesthesia is administered before the screw is inserted. The dentist can use local infiltration or conduction anesthesia. Solutions of local anesthetics are used for pain relief. Anesthesia using anesthetic gels is widely used. The use of these agents will help make the anesthetic injection unnoticeable, which is especially important in pediatric orthodontics.

The installation location of the microimplant is the interroot space of two adjacent teeth on the upper or lower jaw.

Installation of the structure is carried out with a special screwdriver and takes 10-15 minutes. Above the surface of the mucous membrane there is a screw head, to which elastic elements (springs, ligatures, etc.) are attached. They will move the teeth in a given direction.

**CARE OF MICROIMPLANTS**

In the first 2-3 days after installation, the dentist may prescribe prophylactic agents in the form of gels with

Metronidazole, antibacterial, antifungal components. Teeth should be brushed carefully with a soft toothbrush. Avoid eating very hot, cold or hard foods. Be sure to rinse your mouth after eating.

In the future, it is important to follow general rules of oral hygiene.

**EXTRACTION OF MICROIMPLANTS**

Removal is quick (2-3 minutes) and painless. It is carried out at the end of orthodontic treatment, after the bite has been corrected.