

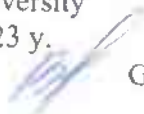
**UKRAINIAN MINISTRY OF HEALTH
Odessa National Medical University**

**Dentistry Faculty
Department of orthodontics**



**GUIDELINES
For practical lesson
From the academic discipline**

Dentistry Faculty, course 4
Academic discipline – Modern technologies of non-removable
orthodontics treatment

Discussed and approved at meetings of the
orthodontics department
Odessa National Medical University
Protocol № 1 from 31.08. 2023 y.
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Odessa – 2023

Practical lesson №1

Topic: "Hardware method of treatment. General characteristics of the method. Indications for use in different age periods."

Purpose: To learn the classification of devices, to know the types of devices, their structure, the principle of action and their role in the treatment of SCA. Master the skills of forming the final diagnosis of orthodontic patients and be able to prescribe appropriate orthodontic treatment with the help of devices in different age periods.

Basic concepts: Anatomy and physiology of a child's ADHD, physiological and pathological bites, classifications of orthodontic devices, facial muscles, masticatory muscles, periodontium, alveolar processes, jaw bones, TMJ structure in children of different ages.

Equipment: Gypsum models, TRH, orthopantomograms, removable and non-removable orthodontic appliances for the upper and lower jaw, typodont.

Plan

1. **Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).**

2. **Control of the reference level of knowledge (written work, written test, frontal survey on basic terminology, etc.)**

3. **Questions (test tasks) to check basic knowledge on the topic of the seminar:**

Methods of treatment of orthodontic patients

– Hardware method of treatment

- Indications for the use of orthodontic devices depending on the age of the patient

- Contraindications to the use of orthodontic devices

- Timing of teeth eruption and root formation

4. **Discussion of theoretical issues:**

5. **Classification of orthodontic appliances**

By way of action:	By fixation method And the method of action:	By fixing method:
1. Mechanical action	1 single maxillary single maxillary	1. Stationary ionic

2. Functionally effective	2 single jaw interjust	2. Retsiprok nye
3. Functional guides	3. axillary; intermaxillary	
4. Combined		
By fixing method:	By localization: 1 Intraoral	1. vestibular s
1. Not removable		2. Oral s
2. Removable		
3. Combined		
	2. Extraoral	1. parietal-occipital
		2. Frontal- occipital 3. combination
By design type : 1. Arc 2. Burl 3. Plate parts 4. Block 5. Wireframe 6. Elastichn s	3. Cervical 4. Jaw	1. Superior labial 2. The lower lip 3. Chin 4. Submandibular 5. On the corners of the lower jaw 6. kombirovannye

Apparatus method of treatment

Orthodontic instrumental treatment of dentoalveolar anomalies and deformities includes:

- expansion of dental arches;
- narrowing of dental arches;
- stimulation or growth retardation of the apical base of the jaws
- growth retardation of the entire jaw or a separate area;

- change in the position of incorrectly positioned teeth;
- change in the position of the lower jaw;
- correction of bite height;
 - restoration of the impaired function.

4. Topics of reports/abstracts

Functionally-active orthodontic ap Paraty:

The therapeutic effect is based on a directed change in the dynamic balance between the facial muscles, continuously acts on the dentition in the lingual direction and the tongue, which counteracts this pressure in the vestibular direction.

The devices are used in the period of milk and at the beginning of the first period of mixed bite.

The vestibular plates of **Kerbitz, Schoncher, Kraus, Muehlemann, Dass, Hinz** are designed to normalize the function of facial muscles. Protect the dentition from the pressure of the lips, cheeks, fingers. **Devices with a tongue grate** normalize **tongue** position and prevent excessive pressure on the front teeth.

Structural elements - cheek shields, lip pads, vestibular dumbbells, bounding bars for the tongue.

Dr. Hintz's vestibular plates are a preventive device for early orthodontic treatment at the age of 3-6 years. With the elimination of bad habits, they prevent the development of soft tissue dysfunctions that cause deformation of the dentition in the milk bite. The vestibular plate is standard, with a bead, with a peak, with a wire shutter .

Pre-orthodontic Trainer - corrects myofunctional bad habits and straightens the teeth that erupt.

The devices proposed by **Frenkel** - function regulators - are a removable two-jaw apparatus, the main parts of which are side shields and

vestibular pilots. Parts of the apparatus are bound by metal arcs made of elastic wire. Three types of apparatus - the first and the second for the treatment of distal occlusion, the third - for the treatment of medial occlusion .

Functional-directional orthodontic appliances

The devices are inclined planes, cushions of the platform, occlusal overlays that move the teeth or the entire lower jaw in the sagittal, transversal or vertical direction.

Fixed devices - Katz crown, Schwarz crown

Removable apparatuses - Bynin's mouthpiece, Schwarz's plate with an inclined plane, Schwarz's plate with a bite pad or occlusal pads, Katz's plate.

The founder is **A.Ya. Katz** - believed that the strength of functionally acting apparatus is regulated by periodontal receptors. It can act until a certain point, if it becomes excessive, then pain occurs, and muscle contraction is weakened or stopped. The source of strength is the contracture of the masticatory muscles during the period of contact of the teeth with the inclined plane, the cusp pad or occlusal pads. The dentition is separated, the devices operate intermittently.

Mechanical impact devices

They are characterized by the fact that the strength of their action lies in the design of the apparatus itself and does not depend on the contractile ability of the masticatory muscles.

The source of the force is the active part of the apparatus: elasticity of the arc, springs, elasticity of rubber traction and ligatures, force developed by the screw.

The intensity of the apparatus is regulated by the doctor, using their active part. The force of pressure or thrust must be individual.

1) Non-removable mechanical-acting devices . Engl proposed vestibular circular arches - stationary, expansive, sliding. These devices were further developed in the arc devices of Herbst, Mershon Simon, Korkhaus-Linde, Stanton.

Fixation devices with crowns or rings on non-prepared permanent premolar or molars after orthodontic separation. Angle's devices are called universal, since they can be used to treat various anomalies of the dentoalveolar apparatus.

- **Stationary Angle arch** - used for the vestibular movement of incorrectly positioned front teeth: tying teeth to the arch with ligatures, they move them. The arc is activated by pidgvinchuvannyam nuts and moving the arc forward.

- **Angle's expansive arch** - used to expand the dentition. Depending on the area in which the dentition needs to be expanded, the arch is set accordingly.
- **Angle sliding arch** - used to tilt the front teeth to the palatine or lingual side. The arc is turned into a sliding one: the nuts are removed, and in the area of the canines, medially open hooks are soldered to the arc. After the arc is inserted into the tubes, the hooks are put on rubber rings and secured to the rear end of the tube. The rubber rod displaces the arch distally.
- **Apparatus Ainsworth** - used for uneven expansion of the dentition and elimination of the close location of the incisors.
- **Simon's apparatus** - used to expand the dental arch in the area of perolaria and molars, returning molars around the axis.
- **Iershon's apparatus** - used to expand the dental arch.

Apparatus Pozdnyakova - used to remove teeth from the palatal position. Apparatus consist of crowns fixed to the first permanent molar and palatine on the tooth. A bar from the vestibular side is soldered to the crown on the molar, the second end of which rests on the tooth, which is standing. Hooks are soldered to the crown of the palatine tooth. The apparatus brings into force an elastic ligature applied to the hooks of the moved tooth and the bar.

- **The Eisenberg-Herbst apparatus** is used to move the upper frontal teeth orally, change their inclination and shorten the dental arch in the presence of gaps between the frontal teeth.

- **Vasilenko apparatus** - used to rotate teeth.

1) Removable mechanical impact devices .These include lamellar devices in combination with screws, springs, vestibular arches. Removable devices operate intermittently, with less force.

- **Kurylenko apparatus** - for moving teeth in the mesiodistal direction.
- **Doroshenko apparatus and Roberts apparatus** - for teeth distalization.

Combined action apparatus

They are used for combined pathology, make up 75% of all removable equipment.

Functional devices supplemented with active elements - screws, springs, which are used to accelerate the movement of individual teeth .

The Andersen-Goipl activator helped to restore the function of closing the mouth, breathing, chewing, swallowing, activated the chewing muscles and stimulated growth in the mandibular joints.

• **Open Klammt activator, Bimler** bite shaper, Balters bionator.

These devices consist of upper and lower plates connected by a base material. A vestibular arch, springs, a screw can be added to them. The action of the apparatus is based on the reduction of the chewing and mimic muscles and the force of action of mechanical elements. Activators were used mainly at night.

The disadvantage of activators is slow action, excludes the possibility of using activators in boys and adults .

Khurgin apparatus is used to treat prognathia and deep bite in the presence of a narrowing of the upper dentition.

• **Apparatus Bruckle** - used for palatal inclination of the anterior teeth of the upper jaw and forced progeny.

• **Bionator Balters. There are three types of devices:**

- the first - to eliminate the narrowing of the dentition, protrusion of the front teeth and deep bite;
- the second - to eliminate open bite;
- the third - to eliminate the mesial occlusion.

Three stages of orthodontic treatment:

I - the stage of displacement of the teeth from its original position;

II - stage is characterized simultaneously by the processes of resorption of the alveoli in places of pressure and the formation of new bone in places of opposite pressure; (This stage is the longest and depends on the patient's psycho-emotional state, the density of the bone structure of the alveoli, the nature of the applied pressure of the orthodontic apparatus). At the second stage, less force is needed to move the same tooth, since the trigger mechanisms have already passed at the first stage, the processes of resorption and new formation of bone tissue of the alveolar process must be maintained at the same level.

In case of insufficient effort, movement will not occur, with excessive effort, the regeneration processes will lag behind. Stimulation of the

regeneration processes should be aimed at restoring the bone structure in the places of the alveolar depression on the side of the opposite pressure.

III - the stage of the fixed results of the movement of teeth and restoration of the structure of the bone tissue around the roots of the teeth. At this stage, the process of moving the ZTSBIV has already been completed.

5. Summarizing the information received at the lesson.

6. List of recommended literature:

Main:

1. Lectures on the relevant topic.
2. Flis P.S. et al., Orthodontics: a textbook for students of stomatological faculties of higher medical educational institutions of IV level of accreditation - Kyiv, 2019, 305p.
3. Golovko N.V.-Orthodontics.-Poltava.-2015. - with. 128-132.
4. L. V. Smagliuk Basic course in orthodontics / L. V. Smagliuk, A. E. Karasyunok, A. M. Bilous. – Poltava: Blitz Style, 2019. – P.173-184.

Additional:

1. Маланчук В.О., Борисенко А.В., Фліс П.С. та ін. Основи стоматології. - Київ: «Медицина», 2009 р.
2. Ravindra Nanda, Flavio Andres Uribe - Atlas of Complex Orthodontics.- Elsevier Health Sciences, 2016, 424 p.
3. Charles J. Burstone, Kwangchul Choy. - The Biomechanical Foundation of Clinical Orthodontics. – e-book - 2020 г.
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8. 3D Diagnosis and Treatment Planning in Orthodontics: An Atlas for the Clinician 1st Edition ed. by Jean-Marc Retrouvey (Editor), Mohamed-Nur Abdallah (Editor) 2021.

Information resources

1. Державний Експертний Центр МОЗ України
<http://www.dec.gov.ua/index.php/ua/>
2. [Laura Mitchell](#), «An introduction to orthodontics», 2013 – 336 p.
3. Національна наукова медична бібліотека України <http://library.gov.ua/>
4. Національна бібліотека України імені В.І. Вернадського
<http://www.nbuv.gov.ua/>

Practical lesson №2

Topic: The history of the development of braces – technique. Indications and contraindications for treatment and preparation of orthodontic patients using a brace system. Componenti of brace - systems. Methods. Characteristics of orthodontic arches, their types and applications

Purpose: To acquire basic knowledge about the history of the creation and development of the brace technique, to know the main indications and contraindications for the use of the brace technique in children of different ages, to be able to characterize the components of the brace system.

Basic concepts: Bracket system, edgewise technique, orthodontic arches, forces in orthodontics.

Equipment: Typodont, a standard set of braces for the upper and lower jaw, molar locks, orthodontic rings, orthodontic arches for the upper and lower jaw.

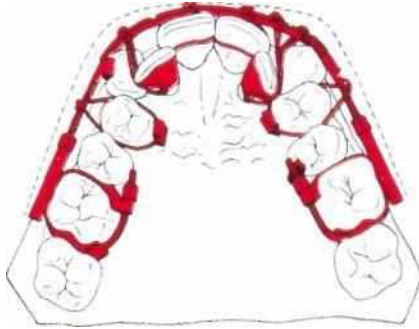
Plan

1. **Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).**
2. **Control of the reference level of knowledge (written work, written test, frontal survey on basic terminology, etc.)**
3. **Questions (test tasks) to check basic knowledge on the topic of the seminar:**
4. **Discussion of theoretical issues:**

From the Angle arc to the edgewise technique

Edward Angle is called the "father of modern orthodontics" not only because of his contribution to classification and diagnosis, but also because of his invention in the

development of new orthodontic devices. With only a few exceptions, the fixed appliances we use in modern orthodontics are based on the Angle design developed in the early 20th century.



Angle has developed four main systems:

E-arc. At the end of the 19th century, a typical orthodontic appliance was a kind of rigid frame, in which the teeth were fixed in such a way that they could only be expanded along the arch. The first Angle device, the E-arch, was of this type: the rings were located on the molars, and a powerful vestibular arch was laid along the arch. The ends of the arc had

a thread, and a small nut screwed onto the section with threaded, allowed the arc to move forward to increase the perimeter. Individual teeth were simply attached to this expanding arch.

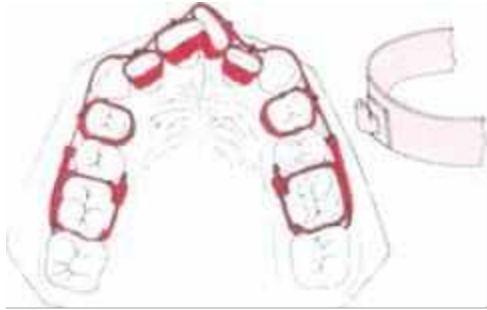
Until the 1980s, such devices could still be found in the mail order catalogs of some orthodontic laboratories, probably due to their simplicity, but despite this, they provided only severe intermittent forces.

The E-arch was capable of only tilting the teeth in the new position. She could not ensure the exact position of a single tooth. To solve this problem, Angle began to fix the rings on other teeth and used vertical tubes on each tooth that included a pin soldered to a small wire arch

With the help of such a device, the tooth was moved by changing the position of each pin individually.

The creation and adjustment of such a pin-tube apparatus required enormous forces, and although it theoretically possessed greater accuracy of tooth movements, it was impractical for clinical use. It was said that only Angle himself and one of his students managed to make such a device. The relatively heavy bearing arch had poor elasticity, and the problem was that a large amount of apparatus correction was required.

ape arc. In the next appliance, Angle modified the tube on each tooth into a vertically aligned rectangular groove. A 10x20 gold wire arch was installed in the grooves and secured with pins. Such an arch immediately began to enjoy success, primarily because it, unlike its predecessors, was quite small and elastic, and also quite effective for aligning mixed teeth. Although such an archwire could be twisted when placed in a groove, the main weakness of this appliance was that it provided relatively poor control of root position. The elasticity of the ribbon wire arch simply will not allow to create the moments necessary to create root torque.



The Angle edgewise technique got its name after the wire arch was set at an angle of 90° to the plane of the ribbon arch installation. The rectangular wire was reinforced in a rectangular groove with ligature wires, which provided excellent control of the root position. The lugs at the corners of the occlusal rings tied to the wire arch required to control the rotation, as on the distal side of the upper left central incisor in this photograph.



The groove dimensions were changed to 0.22×0.28 inches and 0.22×0.28 precious metal wire was used. These dimensions were obtained as a result of numerous experiments and provided a real good control of the position of the crown and the root in three planes of space.

After the invention in 1928 this device became the mainstay in treatment with the use of multi-ring fixed devices, although tape-shaped arches continued to be used for another decade.

Other early apparatus systems

Angle always sought arch expansion rather than tooth extraction to correct crowding, but ironically the EdgeWise system ultimately provided the control of root position necessary for successful extraction treatment. The device was used for these purposes for several years after its invention.

Charles Tweed, one of Engle's students, was the first in the United States to adapt the Edgewise system for extraction treatment. However, this did not require much effort.

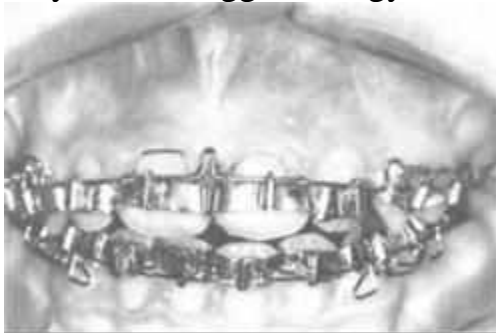
Tweed moved the teeth corporeally and used a distribution method to control the abutment, first moving the canines distally along the archwire and then applying incisor retraction.

Raymond Begg in the 1920s, before his return to Australia, studied the use of the ribbon arc apparatus at the Angle School. Begg also concluded that extraction

treatment was necessary and decided to adapt these arches to provide better control of root position.

Begg released a modification of the device in three stages:

- 1) it replaced the precious metal band arch with 0.16-inch high-strength steel wire, which became available in the late 1930s;
- 2) he kept the original band arch bracket, but turned it so that the groove was directed to the ash, not to the occlusal side;
- 3) he added additional springs to control the position of the root. As a result of this friction was reduced to a minimum, because the contact area between the bracket of the device and the arch, as well as the pressure of the wire on the bracket, were very small. Begg's strategy for controlling the support part was tilt/level



In the 1980s, Andrews developed a modification of braces for each tooth to avoid the need for the multiple curves on the arch that were necessary to compensate for the difference in tooth anatomy. As a result, the "straight arc" technique was created. This was a key moment in the improvement of the edgewise technique. The "straight arc" technique includes:

Variants of the thickness of braces to compensate for different thicknesses of individual teeth.

In the original edgewise technique, vestibulooral bends on the arch (first-order bend) were necessary to compensate for the different contours of the vestibular surfaces of individual teeth. In modern devices, such compensation is built into the base of the bracket itself, eliminating the need for compensatory bends (which may be needed in individual cases of individual tooth thickness deviations).

Angulation of the braces groove. The inclination of the brackets relative to the axis of the tooth is necessary to ensure the appropriate location of the roots of a large part of the teeth. Initially, this mesial-distal location required angular bends on the arch (second-order bends). The angle of the bracket or the groove of the bracket reduces or eliminates the need for such bends on the arch.

Bracket groove torque. Since the deviation of the front surface of the teeth from the vertical is different for individual teeth, when using the original edgewise technique, torsional bends were required on each segment of the rectangular arch (third-order bends, or torque). The grooves of the brackets in the modern contour

apparatus have a torque to compensate for the deviation from the front surface, so the bending of the third order is no longer so necessary.

The angulation and torque of the braces is usually called the prescription of the system.

Self-ligating braces. Placing wire ligatures on the wings of the brackets to secure the wire arches in the grooves may require a lot of time. Elastic modules, introduced in the 1970s, have supplanted ligature wires for two reasons: they are easier and faster to install and can be used to close small gaps.

To fix the wires in one position, it is possible to use caps or locks built into the bracket, and different versions of such brackets were offered for use at different times. In the 1980s, spring-clamp brackets (SPEED, Orec Corp.) were introduced, which are widely used today, and more recently, rigid-fixation systems have appeared to hold the archwire in the bracket groove. These braces can be clamped and unclamped faster, but the elastic chains are still required to control the gaps in the arch, so the speed of placing and removing the arches is not a decisive advantage.

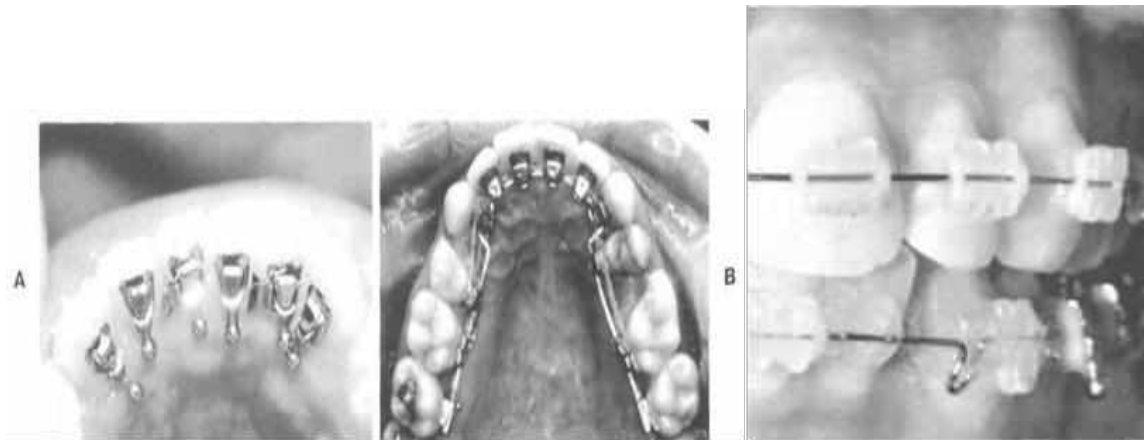
It turned out that braces with spring clamps have much less friction than ligature ones, and the teeth slide more freely on the wire arches. However, this advantage is also a disadvantage for closing gaps without sliding. Spring clamps cannot provide sufficient archwire fixation to create adequate anti-tilt moments when closing loops are used, and it is quite difficult to insert a full-size archwire into the bracket groove when using rigid clamps.

Lingual apparatus. After the invention of adhesive fixation in the 1970s, it became possible to install fixed elements on the lingual side of the teeth and create an invisible fixed device.

Adaptation of edgewise equipment for possible installation on the lingual surface requires significant changes in the shape of brackets, but the principle of installation of a rectangular wire in a rectangular groove remains unchanged. The evolution of lingual appliances continues, and today's braces are significantly different from those used in the first appliances

Theoretically, the same control of crown and root position in three planes can be obtained from the lingual side, and considerable progress has been made in this direction, but the main problem has been the small position between the lingual brackets. Although with the help of modern lingual devices it is possible to carry out complete treatment of anomalies of occlusion of little complexity, the laboriousness, duration and cost of treatment are quite high.

At the present time, it should be recognized that lingual devices do not yet justify the hopes placed on them. The use of ceramic brackets on the vestibular surface is much easier for doctors and patients than the use of lingual techniques.



5. Topics of reports/abstracts

- Be able to describe the structure of the bracket
- Be able to demonstrate the fixation of the bracket, as well as individual elements of the bracket system, on a typodont
- Be able to replace elastic and metal ligatures

6. Summarizing the information received at the lesson.

7. List of recommended literature:

Main:

1. Lectures on the relevant topic.
2. Flis P.S. et al., Orthodontics: a textbook for students of stomatological faculties of higher medical educational institutions of IV level of accreditation - Kyiv, 2019, 305p.
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Practical lesson №3

Topic: Orthodontic accessories, characteristics and their use in treatment with braces (ligatures, elastics, separators, springs, elastic chains). Characteristics of orthodontic tools, their functional purpose

Purpose: To acquire basic knowledge about the components of the brace system, to know the main indications and contraindications for the use of the brace technique in children of different ages, to be able to characterize the components of the brace system

Basic concepts Bracket system, edgewise technique, orthodontic arches, forces in orthodontics

Equipment: Typodont, a standard set of braces for the upper and lower jaw, locks for molars, orthodontic rings, orthodontic arches for the upper and lower jaw, elastics, ligatures, springs

Plan

1. Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

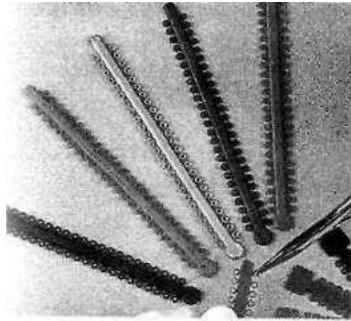
2. Control of the reference level of knowledge (written work, written test, frontal survey on basic terminology, etc.)

3. Questions (test tasks) to check basic knowledge on the topic of the seminar:

- to know the indications and contraindications for using the brace system in children of different ages
- biomechanics of tooth movement in three mutually perpendicular planes; what morphological changes occur in periodontal tissues during tooth movement; biomechanics of horizontal tooth movement according to Kalvelis;
- to know the anatomical and physiological features of the structure of the chewing apparatus;
- to know the features of the structure of the maxillofacial area and TMJ
- to be able to characterize temporary and variable bite
- to know the peculiarities of TMJ structure in children of different ages

4. Discussion of theoretical issues:

Different ligatures are used to fasten the arch in the bracket. In the initial stages of treatment, elastic ligatures are used. They are quite aesthetic, easy to apply, the individual movement of the tooth occurs better when the arch is fixed in the bracket with an elastic ligature; but elastic ligatures do not ensure reliable filling of the bracket groove with an arc, when the ligature is stretched due to swelling, the arc may partially come out of the groove, in this case, it is necessary to replace the ligature urgently, otherwise an uncontrollable tilt of the tooth may occur.

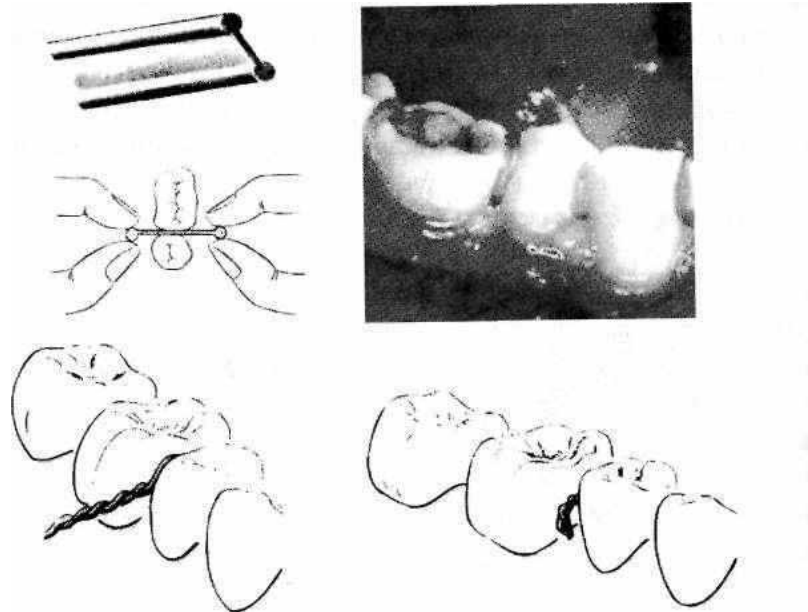


The arch in the groove of the bracket can also be fixed with a metal ligature in the form of a thin steel wire with a diameter of 0.20 to 0.35 mm, preformed in order to immediately bypass the wings of the bracket. For correct fixation of the orthodontic arch in the groove of the bracket, the ligature is clamped with Matthews, Steiner, etc. forceps, which resemble a hemostatic clamp in design. In addition to the usual preformed ligature, a Kobayashi ligature with a hook is used, which can be used to fix unimaxillary or intermaxillary elastic traction. To prevent deformation of the hook when using an intermaxillary elastic traction, a wire ligature with a diameter of 0.30-0.40 mm is used.

In order to avoid injury to the soft tissues of the lip and cheeks, it is fundamentally important to bring the end of the ligature on the upper jaw under the arc from the bottom up, and on the lower one - from the top down.

Materials for physiological separation.

Physiological separation of the teeth is carried out before fixing the rings. For this purpose, special wire, rubber or elastic separators of various shapes and sizes are used



Elastic separators are called elastics. They are used for separation, rotation, as well as for closing gaps between

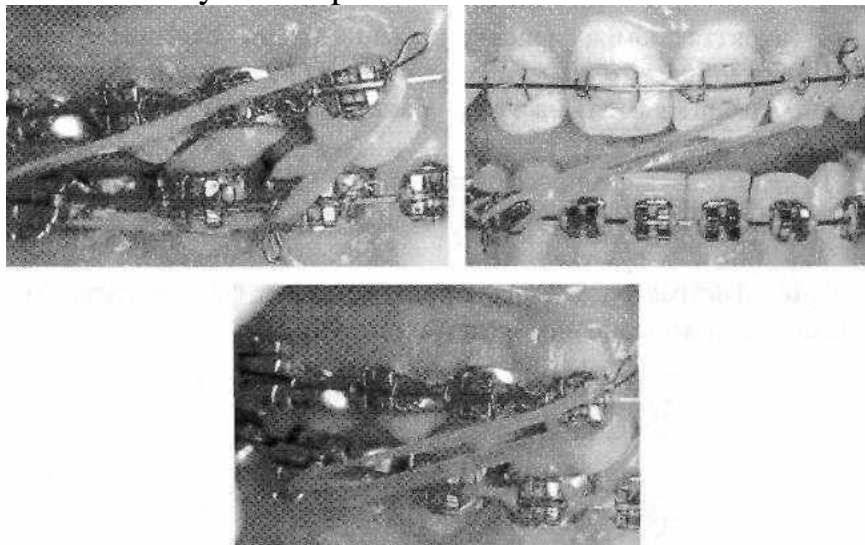
teeth. There are elastic rings and elastic chains. Both types of elastic bands are suitable for separating teeth.

In the area of molars, the separation device is installed first from the distal side of the tooth, and then from the mesial side.

After a week, the separation ligatures are tightened and left for another 2-3 days or removed if they are mobile. Sometimes a bronze-aluminum wire with a diameter of 0.5 mm is used for these purposes. To carry out a ligature between the teeth, special pliers or needle holders are used. After placing the ligature between the teeth, it is twisted clockwise.

Orthodontic elastic rings

By "elastics" we mean elastic rings of different sizes. They are used as inter- and intramaxillary elastic pulls



They are worn

constantly or need to be replaced every day. When choosing different sizes (size data is given in inches), the resulting traction force is of decisive importance. The decrease in strength during the first day is about 40%.

When choosing rings, the force they develop is important. You can use the following classification (size in inches):

1/8

- a) elimination of spaces between teeth;
- b) elimination of buccal occlusion and crossbite;
- c) closing the open bite in the lateral and frontal areas;
- d) improvement of occlusal contacts.

1/6 or 1/46

- a) canine dystopia;
- b) as an intermaxillary elastic traction in II and III classes.

5/16 or 3/8

a) retrusion of the front teeth on the upper jaw in combination with the facial arch (elastic pulls are fixed on the hooks of the facial arch in the area fangs);

b) closing gaps after removing rings from front teeth.

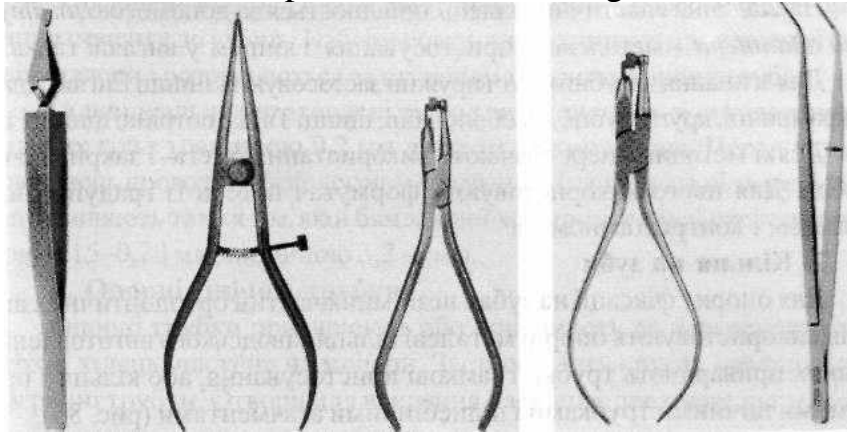
In order to more accurately determine the required length of the elastic chain, it is worth using the following practical rule: take the same ring for each tooth.

Applying the rings is facilitated by the use of a ligature adapter of a metal device with a hook end. There are compression springs and tension springs. Springs can be made of cobalt-chromium metal, nickel titanium or TMA. Compression springs are indispensable when it comes to creating space within the dental arch area.

Tension springs are used as a replacement for first-class traction or as an alternative to closing loops.

Characteristics of orthodontic instruments

For treatment with the help of non-removable arch dental appliances, the following are necessary: special tools; molar rings; support tubes; braces; orthodontic wire arches; ligatures; elastic rings; locking devices; lip retractor; device for determining the level of placement of braces - positional template for braces; facial arches and head caps; materials for fixing braces, etc.



The main tools for working in the patient's mouth during treatment using the bracket technique are the tools combined into a group of auxiliary forceps. They are designed for installing the arc in the groove of the bracket, removing the arc from the groove. They are also used to bend the arch behind the buccal tube, hold the arch during fitting, activate the hinges, direct the arch into the groove of the braces, etc.

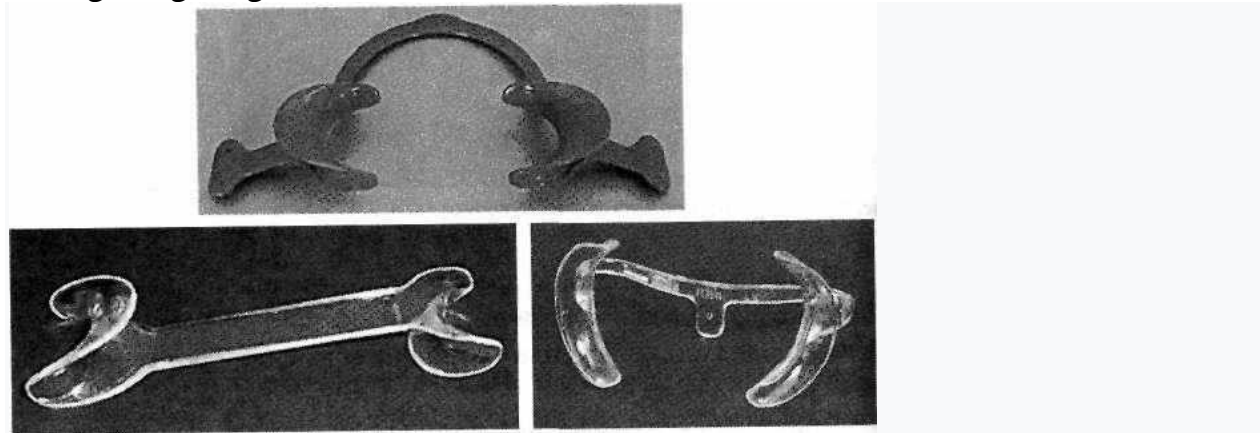
Distal nippers are used for biting round and rectangular wire in the distal parts behind the buccal tubes. The small cutting part of the tool allows the wire to be bitten at a distance of 0.5 mm from the buccal tube, while the holding part prevents the cut part of the wire from bouncing.

Ligature nippers designed for biting ligature wire are produced by "ORMCO" corporation in two configurations: straight and 15°. In the latter, the cutting edges have an inclination angle of 15°, which provides better access and inclination, they are also produced with extended handles. Weingart forceps are designed mainly for working with orthodontic arches in the patient's mouth. Wick pliers are available in two versions. Wick-45° are designed for working with wire arches and for installing and removing lip bumpers, they are also used for bending closing hinges. Wick-90° are designed to activate rotary wings on premolars and lower incisors, they are convenient when working distal to molars.

Howe forceps are used when working with orthodontic rings in the patient's mouth. The scaler is designed to remove excess fixing material. Reverse tweezers are designed to hold the bracket when it is fixed; special forceps are used to remove brackets and rings on the back group of teeth; to prove the shape of the arc, contour tongs are used. To fix the orthodontic arch in the groove of the bracket with the help of a ligature, forceps of Mathews, Steiner, etc., which resemble a hemostatic clamp in design, are used.

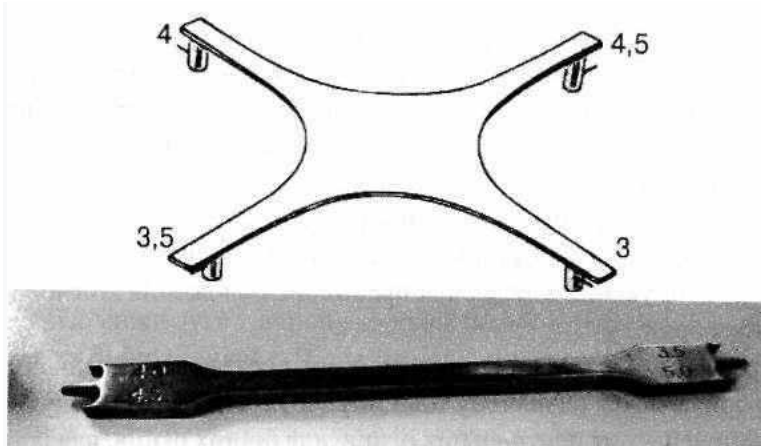
Applying elastic rings is carried out using a ligature adapter - a metal device with an end in the form of a hook. Angle, Adams, crampon, round-nose pliers, beak-shaped, Tweed forceps, triple forceps, etc. are used to bend dental arches and springs. Some techniques involve the use of omega and closing loops. For this, a loop former with a graduated stamp and a counterstamp is used.

The lip retractor ensures the spreading of the lips, the fixation of the cotton balls during the gluing of the braces



Positional template for braces

The device for determining the level of the location of the bracket on the tooth is called a positioner. Boone's positioner - a measuring device that facilitates the determination of the level of the location of the horizontal groove of the bracket from the cutting edges of the incisors or the tops of the ridges of other teeth - is a metal cross with appendages on which there are protrusions marked 3,5,4,0, 4.5 and 5.0.



5. Topics of reports/abstracts

6. Summarizing the information received at the lesson.

7. List of recommended literature:

Main:

1. Lectures on the relevant topic.
2. Flis P.S. et al., Orthodontics: a textbook for students of stomatological faculties of higher medical educational institutions of IV level of accreditation - Kyiv, 2019, 305p.
3. Golovko N.V.-Orthodontics.-Poltava.-2015. - with. 128-132.
4. L. V. Smagliuk Basic course in orthodontics / L. V. Smagliuk, A. E. Karasyunok, A. M. Bilous. – Poltava: Blitz Style, 2019. – P.173-184.

Additional:

1. Маланчук В.О., Борисенко А.В., Фліс П.С. та ін. Основи стоматології. - Київ: «Медицина», 2009 р.
2. Ravindra Nanda, Flavio Andres Uribe - Atlas of Complex Orthodontics.- Elsevier Health Sciences, 2016, 424 p.
3. Charles J. Burstone, Kwangchul Choy. - The Biomechanical Foundation of Clinical Orthodontics. – e-book - 2020 г.
4. KALEY ANN.- Evidence-Based Orthodontics.- American Medical Publishers.- 2022, 225p.
5. Bhalajhi SI., et al. “Orthodontics: The art and science”. Sixth edition. Arya (Medi) Publication (2015)
6. William R Proffit., et al. “Patient Interaction in Planning”. In: Contemporary Orthodontics Elsevier Ltd (2019): 138.
7. RamyIshaq. “The Orthodontic Patient: Examination and Diagnosis”. EC DentalScience 18.5 (2019): 975-988

8. 3D Diagnosis and Treatment Planning in Orthodontics: An Atlas for the Clinician 1st Edition ed. by Jean-Marc Retrouvey (Editor), Mohamed-Nur Abdallah (Editor) 2021.

Information resources

1. Державний Експертний Центр МОЗ України <http://www.dec.gov.ua/index.php/ua/>
2. [Laura Mitchell](#), «An introduction to orthodontics», 2013 – 336 p.
3. Національна наукова медична бібліотека України <http://library.gov.ua/>
4. Національна бібліотека України імені В.І. Вернадського <http://www.nbuv.gov.ua/>

Practical lesson №4

Topic: Anchorage (support) during orthodontic treatment. Types of support

Purpose: Learn the classification of anchorage, know the types of anchorage, the principle of action and the role in the treatment of osteoarthritis and deformities. Master the skills of forming the final diagnosis of orthodontic patients and be able to prescribe appropriate orthodontic treatment with the help of fixed appliances in different age periods.

Basic concepts: Anchorage, types of support, classification of anchorage.

Equipment: plaster models, orthopantomograms, calipers, typodonts.

Plan

1. **Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).**
2. **Control of the reference level of knowledge (written work, written test, frontal survey on basic terminology, etc.)**
3. **Questions (test tasks) to check basic knowledge on the topic of the seminar:**
 - Definition of the concept of "support" in orthodontics. Types of supports.
 - Rules for installing orthodontic rings on abutment teeth.
 - Devices that are used to create various types of supports.
 - Advantages and disadvantages of the technique of segmental arches.
 - Methods of canine distalization on the arch.

- Methods of distalization of incisors and canines in a single unit.
- 1.2 questions (test tasks, tasks, clinical situations) to check basic knowledge on the subject of the lesson.
- Morphological changes occurring in the tissues of the alveolar complex during tooth movement
- The value of the force of tooth movement. Complication.
- Basic properties of materials for the manufacture of orthodontic arches and springs.

4. Discussion of theoretical issues:

Support in orthodontics should be understood as a stable position when moving teeth during active treatment. The success of orthodontic treatment depends on the correctly chosen support for each specific case. The doctor must remember that there is always a danger of losing the chosen support. The loss of support may be due to its improper design or the patient's lack of desire to cooperate with the doctor. U. Proffit considered the mechanical aspects of support control. The author noted that friction plays a significant role in the control of the supporting part, especially when closing the gaps with the help of fixed devices.

Friction in orthodontic devices depends on the following factors: the surface of the arches and brackets, the force of contact between the arch and the bracket, the magnitude of the friction force. D. Drescher pointed out that 70% of the load force applied to the moving tooth is lost when overcoming the friction between the groove of the lock and the arch. The frictional force is proportional to the force with which the contact surfaces are pressed against each other, and it is influenced by the properties of the contact surfaces.

Frictional resistance to wire archwires sliding around bracket grooves can be reduced with steel archwires and steel brackets, but it cannot be completely eliminated. The force that mainly determines friction is the force that draws the arch into the bracket, which is carried out with the help of a ligature wire. In the literature, there are conflicting opinions about the correlation between the width of the bracket groove and the magnitude of the friction force. According to some laboratory data, the width of the groove has little effect on friction.

Other studies show that the effect of the width of the groove of the bracket on the coefficient of friction is: the wider the groove, the less friction. Clinical friction-induced abutment control problems arise primarily because the actual frictional force is unknown. Usually, much more force than necessary to move the tooth is applied to ensure clinical effectiveness, and excessive force affects the abutment teeth.

The technique of securing the anchorage of supporting teeth consists of two possible approaches. The first is to reduce the load on the side support part. The second approach is to strengthen the lateral support using extraoral traction, stabilizing intraoral devices, or intermaxillary elastics.

In clinical orthodontics, several methods can be used to solve the problem of reducing the load on the supporting part:

1. Increasing the number of teeth in the supporting segment. In order to minimize the loss of support, several teeth in a fixed part are linked together and one or more teeth are moved in relation to a large fixed group. It is believed that the level of reinforcement of the supporting part depends on the necessary tooth movement. For differentiated tooth movement, the ratio of the area of the periodontal ligaments in the supporting element to the area of the periodontal ligaments of the moving teeth should be at least 2:1 without friction and 4:1 with friction. Smaller ratios result in almost reciprocal displacement.

Strengthening of the supporting part can be done by adding additional teeth of the same arch to the supporting element or by means of elastic modules fixed on the opposite arch.

2. Subdivision of the necessary movement. The most common way to increase the control of the supporting part is to direct the resistance of a group of teeth opposite to the movement of an individual tooth. To reduce tension in the supporting part, canine distalization is carried out individually, opposite to the medial movement of all other teeth of the arch.

After canine retraction is complete, the canine can be attached to the posterior abutment during incisor retraction. The advantage of this method is that the retraction force will be distributed over a large surface of the periodontal ligaments in the supporting element. The disadvantage here is that the two-step closing of the gap will take almost twice as long. In addition, with this technique, an excess of gingival tissue and bone of the alveolar process is formed between the lateral incisors and canines, which must be prevented.

3. Tilt/vertical alignment. The displacement of the abutment teeth can be minimized by creating a system in which the abutment teeth are forced to move corporeally while the mobile teeth are inclined. Optimum pressure on the moving segment will be created at the expense of half the force required for body retraction of these teeth. This means that the retraction force applied to the abutment lateral teeth will be halved and, as a result, the movement of these teeth will be halved. The second stage is the vertical alignment of tilted teeth with the help of distal movement of the canine roots and oral torque of the incisor roots.

For these two stages, it is very important to keep the forces as light as possible so that the teeth in the posterior segment are always subjected to sub-optimal forces and the anterior teeth are subjected to optimal loads.

When removing premolars on the upper jaw, to eliminate crowding or protrusion of frontal teeth and bimaxillary protrusion, it is first necessary to move the canines distally using the first permanent molars as supporting teeth. Distalization of canines on the upper jaw is a routine manipulation during orthodontic treatment. Such movement is associated with a number of possible undesirable consequences: inclination of the canine in the direction of movement, mesial displacement of the supporting teeth, delayed movement of the canines, deepening of the bite in the front section, formation of an open bite in the lateral sections and resorption of the roots of the teeth. It is widely believed that the favorable initial position of the canines is their slight or moderate mesial inclination.

The concept of "bioprogressive therapy" involves the movement of canines with the help of sectoral arches with loops, called retractors. They are bent from blue "Elgiloy" and provide continuous body movement of the canine. In contrast to the movement of the canine in an enveloping arc, there is no friction in these retractors. Segmental canine retraction using frictionless springs is an attractive method of reducing the load on the supporting part that can be used in modern appliances. Although there is an opinion about the lack of closing gaps with the technique of segmental arches, which is not so much an increased complexity as a lack of the necessary level of reliability.

Without a rigid connection between the anterior and lateral segments, nothing can preserve the shape of the tooth row and the normal vertical relationships in the event of deformation of the retraction spring or its incorrect activation.

In the Edgewise technique, teeth are moved mainly along the arch. However, there are factors that slow down the mechanics of sliding: insufficient alignment of the teeth, which causes bending of the arch; torque of lateral teeth (torque and sliding of teeth cannot occur at the same time);

blocking the distal end of the main arch with a wire ligature; damaged or deformed braces that bend the main arch; resistance of soft tissues in the post-extraction areas; resistance of the cortical plate (narrowing of the alveolar process in the post-extraction hole); the use of excessive forces, which cause tilting of the teeth and bending of the arch; obstacle from antagonistic teeth; insufficient strength.

Application of force along the arc is usually implemented with the help of elastic rubber rings that are changed daily (class 1 elastics). Class II and III intermaxillary elastics are used to achieve and maintain class I canine ratio. Elastic chains are also used to distalize the canines. In the oral cavity, the material of elastic ligatures and

chains is able to provide an independent force effect for approximately 3-4 days. Further stay of the elastic chain in the patient's mouth is advisable from the point of view of elimination of side effects of movement

The use of certain elastic materials for tooth movement, the frequency of activation and the type of wire arch depend on the force system that the orthodontist chooses in his work. When closing gaps, eliminating rotations, trioms and diastemas, distalization of canines for the same purposes as an elastic chain, a power thread is used. The advantage of this is the fact that for each specific patient, the strength of the effect can be determined by the doctor himself, and not by the size of the chain gap

Also, independent distal movement of the canines can be obtained using NiTi springs stretched from the first molars to the canines. At the same time, you should choose a spring with a force of about 50 g and an arch preformed with a pronounced Speye curve, which will limit the mesial inclination of the molars. Spiral NiTi springs provide almost perfect light continuous force. Elastic rods produce intermittent forces of varying magnitudes, while elastic chains and steel coil springs provide intermittent, rapidly decaying forces.

In order to prevent the unwanted inclination of the teeth in the direction of movement, for distalization of canines, an eight-shaped ligature (laceback) is used, located in each quadrant from the bracket on the last molar to the canine. Eight-shaped ligatures without a rigid support initially cause a slight inclination of the canine with compression of the periodontal gap. But due to the lack of constant elastic traction, there is enough time to straighten the root to the correct position in the form of the main arch.

Also, an important stage of orthodontic treatment, during which the anchorage of the abutment teeth must be preserved, is the tightening phase, when the incisors are retracted. In the bioprogressive technique of Ricketts, to close the gaps and prevent flattening of the frontal segment, they prefer to use the utility - "gathering arc", because it provides maximum torque control. Also, for these purposes, in the edgewise technique, steel arcs 0.016" x 0.022" with omega-shaped closing loops are used, and if necessary, flattening of the frontal segment - elastic chains.

Many orthodontists consider the use of extraoral forces, namely the facial arch, to be the optimal way to ensure maximum control of the position of the lateral teeth of the upper jaw. Some authors prefer a face bow with combined traction. To prevent unwanted tilting of the molars, the length of the outer processes of the arch is of great importance. The processes should end at the level of the first molars, thus the forces act through the centers of resistance of the molars, preventing unwanted inclinations

The use of face arches, especially in combination with mono- and intermaxillary pulls, ensures a stable position of the supporting molars. The disadvantage of using

a facial arch as a stabilizer for abutment teeth is the considerable inconvenience for patients. For an ideal anchorage of the supporting molars, it is necessary to wear a facial arch of at least 10-12g. per day at a strength of 200-250 grams, but many patients experience discomfort during sleep when using a facial arch, which leads to refusal to wear the device.

It should also be taken into account that the traction between the supporting and moving teeth works around the clock, while the facial arch anchorage is carried out with full use for up to 12-14 hours. In addition, with improper use of the device, great force, violation of the biomechanics of the facial arch, unwanted and/or extrusion of supporting molars and more serious problems in the form of facial or eye injuries are possible. Positive stabilization results can also be achieved with the use of a palatal brace. It is usually used for derotation and installation of first molars of class 1. The most common problems of using the bugel as an anchoring device are the impossibility of adequately preserving the space and maintaining the passive state of the device. If the device is not passive, unwanted vertical and transverse movements of permanent molars may occur.

Fitting a palatal bracket for anchoring the supporting segments during orthodontic treatment with the removal of upper premolars in cases of palate deformity requires considerable time and effort from the orthodontist.

The Nance arch is a transpalatal arch whose palatal portion contains a button that contacts the palatal mucosa, theoretically providing resistance to mesial movement of the lateral teeth. This device is an effective spatial fixator, but the main problem is irritation of soft tissues due to the adsorption of oral fluid elements. In case of poor hygiene or deformation of the device, the plastic part can hit the mucous membrane of the palate, causing allergic and/or atrophic processes on the mucous membrane of the hard palate. This appliance is not suitable for most Class 2 cases where maxillary incisors are protruding, as the Nance rest will partially interfere with retraction of the frontal area. According to research data, 17-20% of the extraction gap is lost due to the mesial displacement of the supporting teeth when using the Nance stop as a stabilizing device.

Auxiliary devices that can stabilize the abutment lateral teeth of the upper jaw include: 1st-order bends, retainers or omega loops on the arch, ligature of the abutment teeth with an eight-shaped ligature, molar tubes acting in a horizontal direction and responsible for vestibulooral movement and rotational component, we can talk about their use to control the rotation of the supporting molars. The use of a maxillary arch utility as a stabilizing device is auxiliary, since the buccal torque of the roots due to the thin cortical layer on the upper jaw does not provide sufficient anchorage, as on the lower jaw, therefore additional support with the help of Nance arc or main cap.

The possibility of stabilizing the upper supporting molars when using the "Jasper Jumper" non-removable functional appliance in "non-growing patients" with class I and II occlusion anomalies indicates

N. Stuki. However, this device contributes to the protrusion of the lower jaw mesially and/or the labial torque of the lower incisors, which limits its use as a device used only to stabilize the supporting molars on the upper jaw. Also, the non-removable design of the device complicates oral hygiene, and its intermaxillary fixation causes certain inconveniences for patients in everyday life and when eating.

Since the mid-90s of the 20th century, orthodontic implants have become widely used in orthodontics, which, according to long-term research by foreign authors, are able to provide absolute resistance. Currently, the use of microimplants has a high success rate (about 90%), but it is impossible to ensure one hundred percent stability of microimplants when they are used as a support during orthodontic treatment.

Factors affecting the rejection of micro-implants can be divided into those that depend on the patient and those that depend on other causes. The success of installing micro-implants depends to a large extent on the method of implantation and the experience of the doctor. Iatrogenic factors of micro-implant resistance include excessive heat generation during drilling leading to necrosis of bone tissue, damage to or contact with the root of the patient's tooth, insufficient primary mechanical stability of the patient's bone tissue, infection of micro-implants due to poor hygiene, damage to anatomical formations (e.g., nerve, artery, sinus) and micro-implant failure.

The factors that depend on the characteristics of the patient include the presence of systemic diseases of the patient, the quality and quantity of bone tissue at the implantation site, the ratio of the amount of attached cartilage and mobile soft tissue, the age and physical condition of the patient, the qualitative and quantitative composition of the microflora of the oral cavity, salivation, mouth breathing and other factors. Factors that depend on micro-implants include the material of the micro-implant, the quality and shape of its helical surface.

Most studies devoted to the use of microimplants in orthodontic practice previously recommended waiting for osseous integration. Nevertheless, bone integration has its disadvantages: waiting for the connection of implants with bone tissue increases the treatment time, complications arise when removing micro-implants after the treatment is completed, and the price of treatment increases. At the same time, the idea of immediate loading of orthodontic microimplants gained recognition.

In recent years, indications for temporary implantation in orthodontic treatment have expanded significantly: displacement or stabilization of individual groups of teeth; retraction of the front teeth of the upper jaw without loss of stabilizing support; mesial, distal movement of the lateral teeth of the upper and lower jaw; corrections of the inclination of the occlusal plane; intrusion, extrusion of teeth; extraction of retained teeth; elimination of tooth rotations; indirect anchorage. We can talk about the following advantages of using micro-implants in orthodontic practice as a skeletal support, and the use of micro-implants is a technology that maintains high stability of supporting segments; minimum need for cooperation with the patient; surgical manipulation of implant installation can be carried out by the orthodontist himself; predictability of biomechanics of tooth movement; resistance to movement of a group of teeth; shortening the terms of orthodontic treatment; in some cases, the use of micro-implants is possible as an independent device without the installation of a bracket system; biocompatibility and resistance to breakage due to the use of titanium alloy in the manufacture of microimplants; minimal trauma during installation; the possibility of instant loading.

We can also talk about some disadvantages of using this type of equipment in orthodontic treatment, namely: the patient's fear of surgical manipulation; invasiveness of the method; price increase for orthodontic treatment; emerging complications when removing micro-implants at the end of treatment; rejection of the microimplant after installation.

Creating an effective support is an important factor determining the success of orthodontic treatment. The methods of anchoring the supporting teeth of the upper jaw used in orthodontic practice are not always perfect, sometimes cumbersome and/or difficult to use, sometimes unacceptable for a specific patient. Inadequate choice of the anchorage method and its incorrect use over time can lead to the loss of anchorage, which means the appearance of complications that require additional time for treatment, and in some cases to unsatisfactory final treatment results.

5. Topics of reports/abstracts

6. Summarizing the information received at the lesson.

7. List of recommended literature:

Main:

1. Lectures on the relevant topic.
2. Flis P.S. et al., Orthodontics: a textbook for students of stomatological faculties of higher medical educational institutions of IV level of accreditation - Kyiv, 2019, 305p.

3. Golovko N.V.-Orthodontics.-Poltava.-2015. - with. 128-132.
4. L. V. Smagliuk Basic course in orthodontics / L. V. Smagliuk, A. E. Karasyunok, A. M. Bilous. – Poltava: Blitz Style, 2019. – P.173-184.

Additional:

1. Маланчук В.О., Борисенко А.В., Фліс П.С. та ін. Основи стоматології. - Київ: «Медицина», 2009 р.
2. Ravindra Nanda, Flavio Andres Uribe - Atlas of Complex Orthodontics.- Elsevier Health Sciences, 2016, 424 p.
3. Charles J. Burstone, Kwangchul Choy. - The Biomechanical Foundation of Clinical Orthodontics. – e-book - 2020 г.
4. KALEY ANN.- Evidence-Based Orthodontics.- American Medical Publishers.- 2022, 225p.
5. Bhalajhi SI., et al. “Orthodontics: The art and science”. Sixth edition. Arya (Medi) Publication (2015)
6. William R Proffit., et al. “Patient Interaction in Planning”. In: Contemporary Orthodontics Elsevier Ltd (2019): 138.
7. RamyIshaq. “The Orthodontic Patient: Examination and Diagnosis”. EC DentalScience 18.5 (2019): 975-988
8. 3D Diagnosis and Treatment Planning in Orthodontics: An Atlas for the Clinician 1st Edition ed. by Jean-Marc Retrouvey (Editor), Mohamed-Nur Abdallah (Editor) 2021.

Information resources

1. Державний Експертний Центр МОЗ України <http://www.dec.gov.ua/index.php/ua/>
2. [Laura Mitchell](#), «An introduction to orthodontics», 2013 – 336 p.
3. Національна наукова медична бібліотека України <http://library.gov.ua/>
4. Національна бібліотека України імені В.І. Вернадського <http://www.nbuv.gov.ua/>

Practical lesson №5

Topic: Orthodontic appliances for rapid expansion of the palatal suture. Devices for distalization of teeth.

Purpose: To learn the classification of devices, to know the types of devices, their structure, the principle of action and their role in the treatment of SCA. Master the skills of forming the final diagnosis of orthodontic patients and be able to prescribe appropriate orthodontic treatment with the help of devices in different age periods.

Basic concepts: Anatomy and physiology of a child's ADHD, physiological and pathological bites, classifications of orthodontic devices, facial muscles, masticatory muscles.
periodontium, alveolar processes, jaw bones, TMJ structure in children of different ages.

Equipment: Gypsum models, TRH, orthopantomograms, removable and non-removable orthodontic appliances for the upper and lower jaw, typodont.

Plan

- 1. Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).**
- 2. Control of the reference level of knowledge (written work, written test, frontal survey on basic terminology, etc.)**
- 3. Questions (test tasks) to check basic knowledge on the topic of the seminar:**

- to know the anatomical and physiological features of the structure of the chewing apparatus;
- features of the structure of the maxillofacial area and TMJ
- to be able to determine the peculiarities of the child's growth and development in the antenatal and postnatal periods
- to be able to characterize temporary and variable bite.
- Methods of treatment of orthodontic patients
- Hardware method of treatment
- Degrees of ossification of the palatine suture

4. Discussion of theoretical issues:

Derichsweiler's fixed maxillary mechanical appliance with Hyrex screw

The device is a metal frame with support on the first molars and first premolars of the upper jaw. The active element of the design is the Hairex screw (FORESTADENT, Germany). The device is used for accelerated opening of the middle palate seam.

Haas fixed maxillary mechanical appliance

The device is a metal frame with plastic plates designed to increase the support area on the palate. The active element of the device is a special Hairex expansion screw (FORESTADENT, Germany). The device is used in milk bite with support on the second milk molar and canine to open the middle palatal seam.

Derichsweiler fixed maxillary mechanical appliance with Hyrex screw and mini-screw support

The device is a palatal brace, the ends of which are soldered to the rings and fixed on the first molars. A special expansion screw Hyrex (FORESTADENT, Germany) with additional support for mini screws (FORESTADENT, Germany) is built into the construction of the palatal hook. The device is used for accelerated opening of the middle palatal seam.

Non-removable maxillary mechanical device Nord

The device ensures uniform expansion of the upper jaw in a short time. It consists of a supporting part (a cast metal frame) with soldered rings fixed on the first molars and first premolars, special rods connected to the crowns, a Hairex expansion screw (FORESTADENT, Germany) and occlusive overlays. The device is used for accelerated opening of the middle palatal suture.

Fixed maxillary arch apparatus Quad Helix

The device is a four-loop brace, the ends of which are fixed in lock structures located on the palatal side of the tooth row. The locks are soldered to the rings and fixed on the first molars. It is used to expand the upper tooth row.

Fixed mechanical device for forced expansion of the lower jaw with Hyrex lingual screw

The device is a wire hook, the ends of which are soldered to rings that are fixed on the first molars of the lower jaw. The active element of the device is the Hairex lingual expansion screw (FORESTADENT, Germany), which is used for forced expansion of the lower dentition.

B Helix non-removable mandibular arch apparatus

The device is a two-loop brace, the ends of which are soldered to rings that are fixed on the first molars of the lower jaw. It is used to expand the lower tooth row. Apparatus for distalization. Pendulum fixed maxillary device of mechanical action

The basis of the Pendulum device is formed by special wire springs. The device is intended for distalization of the first molars of the upper jaw. Bilateral and unilateral distalization is possible. If necessary, additional expansion is achieved by using a special expansion screw

Pendulum plus fixed maxillary device of mechanical action in combination with an expanding screw

The basis of the Pendulum plus device is formed special wire springs in combination with an expanding screw (FORESTADENT, Germany). The device is intended for simultaneous distalization of the first molars and expansion of the upper jaw. Bilateral and unilateral distalization is possible.

Pendulum plus non-removable maxillary device of mechanical action in combination with Hyrex expansion screw

The basis of the Pendulum plus device is formed by special wire springs in combination with a Hyrex expansion screw. The device is intended for simultaneous distalization of the first molars and expansion of the upper jaw. Bilateral and unilateral distalization is possible.

Fixed maxillary device of mechanical action Pendulum in combination with a sectional screw

The basis of the Pendulum device is formed special wire springs in combination with a sectional screw (FORESTADENT, Germany). The device is intended for one-moment reinforced distalization of the first molars of the upper jaw.

Non-removable maxillary apparatus of mechanical action Pendulum on four bandage rings with the addition of two sectional screws

MSE M.S.E. Prof. Won Moon (Maxillary Skeletal Expander)

- rapid palatal expansion based on mini-implants. An excellent solution for expanding the upper jaw. The indication for the use of MARPE (MSE) rather than SARPE is the second and third degree of ripening of the palatal suture. The success of using MSE orthodontics at the fourth stage of development is doubtful, and at the fifth stage – impossible. The period of use of the device is 1-2 months, but then for another 2-6 months the device must be in the oral cavity, for the purpose of bony restoration of the palatal seam.

Distalizer Distal Jet (American Orthodontic) is a new device designed for distal movement of molars without changing the position of the dental axis. The palatal support of the structure is a plastic base, from which a large-diameter wire extends to the first or second molar of the upper jaw on both sides. This wire is fixed on the premolars using a mesh-like platform or soldered to the rings. Fixation of the device on the premolars is necessary mainly for stabilization, while the application of the forces necessary for distalization is carried out thanks to the palatal plate Apparatus for distalization of molars. Wire segments designed for distalization of molars are fixed in 0.36 inch diameter tubes.

They are located parallel to the alveolar ridge and are at the height of the bifurcation. From the distal side of each tube comes a telescopic movable wire, which ends with a bayonet-shaped arch fixed in the orthodontic palatal lock of the orthodontic ring of the first upper molar. The distalizing fragments of the wire have the form of a double L-loop. As a result of this alignment, the molars can be distalized bodywise. The power element of this device is a nickel-titanium spring located above the tube.

The impact force should be 150 g for children, and 250 g for adults. The springs are compressed and activated using a clamp, activation is carried out once a month.

5. Topics of reports/abstracts

6. Summarizing the information received at the lesson.

7. List of recommended literature:

Main:

1. Lectures on the relevant topic.
2. Flis P.S. et al., Orthodontics: a textbook for students of stomatological faculties of higher medical educational institutions of IV level of accreditation - Kyiv, 2019, 305p.
3. Golovko N.V.-Orthodontics.-Poltava.-2015. - with. 128-132.
4. L. V. Smagliuk Basic course in orthodontics / L. V. Smagliuk, A. E. Karasyunok, A. M. Bilous. – Poltava: Blitz Style, 2019. – P.173-184.

Additional:

1. Маланчук В.О., Борисенко А.В., Фліс П.С. та ін. Основи стоматології. - Київ: «Медицина», 2009 р.
2. Ravindra Nanda, Flavio Andres Uribe - Atlas of Complex Orthodontics.- Elsevier Health Sciences, 2016, 424 p.
3. Charles J. Burstone, Kwangchul Choy. - The Biomechanical Foundation of Clinical Orthodontics. – e-book - 2020 г.
4. KALEY ANN.- Evidence-Based Orthodontics.- American Medical Publishers.- 2022, 225p.
5. Bhalajhi SI., et al. “Orthodontics: The art and science”. Sixth edition. Arya (Medi) Publication (2015)
6. William R Proffit., et al. “Patient Interaction in Planning”. In: Contemporary Orthodontics Elsevier Ltd (2019): 138.

7. Ramy Ishaq. "The Orthodontic Patient: Examination and Diagnosis". EC Dental Science 18.5 (2019): 975-988

8. 3D Diagnosis and Treatment Planning in Orthodontics: An Atlas for the Clinician 1st Edition ed. by Jean-Marc Retrouvey (Editor), Mohamed-Nur Abdallah (Editor) 2021.

Information resources

1. Державний Експертний Центр МОЗ України
<http://www.dec.gov.ua/index.php/ua/>

2. [Laura Mitchell](#), «An introduction to orthodontics», 2013 – 336 p.

3. Національна наукова медична бібліотека України <http://library.gov.ua/>

4. Національна бібліотека України імені В.І. Вернадського
<http://www.nbuv.gov.ua/>

Practical lesson №6

Topic: Concept of retention period. Factors that ensure the stability of treatment results (aesthetic, functional, morphological). Removable and non-removable retention devices, their advantages and disadvantages. The concept of disease recurrence.

Purpose: To learn the classification of devices, to know the types of devices, their structure, the principle of action and their role in the treatment of SCA. Master the skills of forming the final diagnosis of orthodontic patients and be able to prescribe appropriate orthodontic treatment with the help of devices in different age periods.

Basic concepts: Anatomy and physiology of a child's ADHD, physiological and pathological bites, classifications of orthodontic devices, facial muscles, masticatory muscles.
periodontium, alveolar processes, jaw bones, TMJ structure in children of different ages.

Equipment: Gypsum models, TRH, orthopantomograms, removable and non-removable orthodontic appliances for the upper and lower jaw, typodont.

Plan

1. **Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).**
2. **Control of the reference level of knowledge (written work, written test, frontal survey on basic terminology, etc.)**

3. Questions (test tasks) to check basic knowledge on the topic of the seminar:

Methods of treatment of orthodontic patients

- Hardware method of treatment
- Timing of teeth eruption and root formation
- Retention period, retention in different age periods

4. Discussion of theoretical issues:

The hardware method occupies the main place among orthodontic treatment methods and is based on the purposeful redistribution of functional and mechanical load on the teeth and other areas of the maxillofacial area (periodontium, alveolar processes, jaw bones and TMJ).

Hardware treatment consists of two periods: the period of active orthodontic treatment and the retention period. In the first period of treatment, the tooth-jaw system is rebuilt upon activation of mechanically acting or functional elements. In the retention period, the achieved results are consolidated, the device works passively.

Orthodontic treatment of patients includes two main periods: the period of active orthodontic treatment and the period of consolidation of the results of orthodontic treatment (retention). The period of active orthodontic treatment is a complex treatment of patients with dento-jaw anomalies, aimed at preserving the somatic and dental health of the patient, eliminating risk factors, normalizing occlusion and creating physiological conditions for the functioning of the dento-jaw system, the general goal of which is to achieve functional, morphological and aesthetic optimums of the dento-maxillofacial area.

The instability of the results of orthodontic treatment can lead to the recurrence of the maxillofacial anomaly, which makes it necessary to preserve all the new positions of the teeth at the next stage of retention (the period after the end of active treatment). If the conditions of this phase of treatment are not observed, in most cases there is a probability of relapse. All this happens because bone and soft tissues need time to adapt and restore strength. Therefore, in modern conditions, retention becomes a very important part of orthodontic treatment. An increasing number of patients, having gone through a long and difficult path to the expected result, want to keep it for life.

However, there are many situations when the stability of the results of orthodontic treatment is impossible and there is a very high probability of recurrence.

The percentage of relapses is from 30 to 40%. According to Littlewood S.J., Millett T.D. et al.

(2006), after orthodontic treatment, 18.9% of adults and 36.8% of children develop relapse. According to Little R.M. et al. (1998), after several years of retention, the percentage of satisfactory results is registered in less than 30% of patients, and in only 20% of cases there is no tendency to relapse. Therefore, the problem of the stability of the obtained result after the end of orthodontic treatment has been troubling leading orthodontists around the world for more than a decade.

Yes, it is known for sure that the etiology of relapses is multifactorial and very subjective for each individual. Therefore, it is impossible to guarantee absolutely stable results. At the same time, there is no clear explanation of the term "relapse" and which movement should be called "relapse". Relapse must be differentiated with changes that occur due to the maturation of the maxillofacial area or with its age-related changes. According to some authors, relapse is the return of teeth to their original location or in its direction.

The same authors indicate the main signs of relapse: the movement of teeth to their previous position occurs quickly - within several weeks or months, and this is most often associated with mechanical disorders during the treatment and diagnosis of the disease. Such movements, according to the authors, are a consequence of the patient's non-compliance with the doctor's advice regarding the use of the retention device. One of the reasons for relapse is the doctor's failure to take into account the growth and development of the specific patient's dental caries and the lifelong movement of teeth. Thus, the characteristic signs of the action of growth and development factors include: changes in the width between canines, which are more pronounced in women compared to men with age; crowding of teeth in the frontal area, which become more complicated with age (this process occurs very slowly and throughout life); the width between the molars, which varies slightly; changes in the amount of horizontal and vertical overlapping. Alimova M.Ya. and Makeeva I.M. (2009) single out the partial or complete return of teeth to their previous position after a certain period of time and also note that it is necessary to pay attention to a number of natural age-related changes in the process of human ontogenesis, the impact of which on the dento-maxillofacial system must be predicted: the late growth spurt of the lower alveolar process, which directed counterclockwise, and the impulse of the growth of the upper alveolar process in the clockwise direction; muscle imbalance; biomechanics of chewing (for example, the mesial inclination of the molars contributes to the transfer of pressure to the front teeth, which leads to their crowding); ongoing jaw growth (up to 54 years, according to Behrents R.G., 2002).

Alexander R.G. Wick (1998) noted that the following factors contribute to the stability of the results of orthodontic treatment and the reduction of the retention period:

detailed diagnosis and treatment planning with determination of the stage of formation and growth of the maxillofacial area; careful analysis of models, orthopantomograms and teleroentgenograms of the skull; solving the possibility and necessity of correcting orthodontic problems with the help of a facial arch, mask, functional equipment in patients with growth potential and the need to use orthognathic surgery in patients who are not growing; normalization of the shape and size of the upper and lower tooth rows; normalization of the shape and size of the upper and lower tooth rows; correct occlusal contacts and ratios, normalization of the incisal angle. Therefore, mistakes made already at the stage of diagnosis affect the stability of treatment results

D. L. Destang, W.J.S. Kerr (2003, 2005) analyzed data from the literature and identified certain recommendations for maintaining the results of orthodontic treatment: lengthening the retention period; elimination of the causes of anomalies of the maxillofacial area, especially bad habits; hypercorrection of bite pathology; the end of treatment during the growth period; moving the teeth to a position of stable static balance; maintenance of the primary shape of the dental arch; dissection of periodontal fibers in the treatment of rotated teeth, surgical correction of hypertrophied tissue of interdental papillae; restoration of incisors and restoration of tooth contacts; root torque correction to achieve root parallelism; occlusal balance.

According to Andrews L.F. (1972), in the process of orthodontic treatment, for the stability of its results, it is necessary to try to achieve the "six keys of occlusion". The same opinion is held by other authors: correct fissure-bump contacts between the first permanent molars of the upper and lower jaws with the correct inclination of the longitudinal axes of these teeth to the occlusal plane; correct angulation of the longitudinal axes of the crowns of all teeth; correct torque of the teeth and confidence in achieving parallelism of the roots of the teeth; the teeth should not be turned around the axis; the presence of tight contacts between the teeth; the depth of the Spee curve is no more than 2 mm.

Some authors note that for a more stable result, the primary shape of the dental arch and the intercanal distance should not change much; an increase in the intercanine distance leads to crowding in the frontal area, especially in the lower jaw. Alimova M.Ya. and Makeeva I.M. (2009) remind that with a significant narrowing of the apical base, stable expansion is possible only up to 17 years of age when using a non-removable device for breaking the palatal suture.

If expansion of the apical base and elimination of the sagittal gap are required, some authors (16,48) insist on hypercorrection, because the resulting occlusion will in any case have a tendency to relapse.

There is a well-known classification of factors of the etiology of recurrences of dento-maxillofacial anomalies and deformations according to M.Ya. Alimova and I.M. Makeeva (2009). These are general, local, iatrogenic and unknown causes.

The common reasons include family features of the development of the maxillofacial system (in which case it is necessary to expand the indications for removal, to use orthognathic surgery); peculiarities of the status of the body (severe development of the anomaly or its treatment in the presence of infectious somatic diseases: endocrine, cardiovascular, pulmonary, musculoskeletal and digestive systems, etc.); the existence of the organism in adverse environmental conditions; long-term psychological stress.

The local ones include:

A. Anatomical: bone tissue defects in congenital pathology and other etiology; number of teeth; the size of the teeth; discrepancy in the size of the upper and lower teeth; dense arrangement of teeth; violation of closing teeth; incorrect position of teeth; lack of interdental contacts; non-physiological bite; non-physiological inclination of the tooth relative to the base of the jaw (violation of torque and angulation); the dimensions of the alveolar rows;

B. Physiological: disorders in the periodontium due to improper transmission of chewing pressure to the teeth; peculiarities of posture; lack of myodynamic balance; parafunctions; Bad Habits.

Iatrogenic – the doctor's failure to follow the biological principles of orthodontic tooth movement

errors in the diagnosis of pathology; errors in the selection and conduct of treatment; use of powerful forces; reduction of the retention period.

In adult patients, all metabolic processes in the body occur much more slowly than in children and adolescents, and due to the lower mobility of teeth, the retention period should be longer in them.

Maintaining the correct position of the teeth in the post-retention period in patients who had crowding of teeth in the frontal area on the upper and lower jaws is an acute clinical problem [1]. It was found that in the group of patients who were treated with the use of non-removable technology and with the removal of the first premolars, only 30% maintain the correct position of the teeth after several years, and about 20% have a pronounced relapse.

It is impossible to determine which patient will relapse after treatment, taking into account the initial abnormality and changes during treatment. Because of this,

many authors lean towards long-term retention to maintain the results of orthodontic treatment

Therefore, the duration of the retention period cannot be less than 1 year, regardless of the age of the patient and the degree of pathology. Occlusion after orthodontic treatment is considered less stable than natural. Morphological disorders are corrected faster than functional ones, so it is necessary to preserve the obtained results until the state of masticatory and facial muscles surrounding the tooth rows is completely normalized.

The most important issue today is the choice of the design of the orthodontic apparatus. Nowadays, there are two opinions regarding retention methods: hard (using fixed retainers) and soft (using removable retention devices). Non-removable retainers are more attractive to the patient, but after they are removed, slight movement of the teeth begins, which cannot be controlled. Removable devices are unaesthetic and inconvenient for the patient. However, they provide soft retention, create more favorable conditions for the formation and consolidation of myodynamic balance.

Single-jaw devices preserve the shape and size of the dental rows, as well as the position of individual teeth, but are ineffective when retaining the results of active treatment of occlusal anomalies. In this case, double-jaw retention devices are effective, which also have a number of disadvantages.

Retention devices are subject to the following requirements:

- the device must reliably store the result of orthodontic treatment, keep the teeth and jaws in a new position;
- the possibility to change the mode of wearing from round-the-clock to dosed;
- the physiological mobility of the teeth and the movements of the lower jaw should be limited to a minimum;
- the device must be passive;
- minimal impact on the aesthetics, articulation, phonetics of the patient;
- to ensure easy hygienic care of the oral cavity;
- convenient fixation of the device for the patient;
- the device must be available for disinfection;
- the device material must be resistant to bacterial contamination;
- the design of the device should not create or worsen the caries situation in the oral cavity.

In modern conditions, the issue of recommendations regarding the choice of the design of the retention apparatus depending on the general factors of the postural-logical stability of the human body in space has not yet been resolved.

5. Topics of reports/abstracts

Peculiarities of the retention period after completion of early orthodontic treatment.

–Factors that ensure the stability of treatment results (aesthetic, functional, morphological).

6. Summarizing the information received at the lesson.

7. List of recommended literature:

Main:

1. Lectures on the relevant topic.
2. Flis P.S. et al., Orthodontics: a textbook for students of stomatological faculties of higher medical educational institutions of IV level of accreditation - Kyiv, 2019, 305p.
3. Golovko N.V.-Orthodontics.-Poltava.-2015. - with. 128-132.
4. L. V. Smagliuk Basic course in orthodontics / L. V. Smagliuk, A. E. Karasyunok, A. M. Bilous. – Poltava: Blitz Style, 2019. – P.173-184.

Additional:

1. Маланчук В.О., Борисенко А.В., Фліс П.С. та ін. Основи стоматології. - Київ: «Медицина», 2009 р.
2. Ravindra Nanda, Flavio Andres Uribe - Atlas of Complex Orthodontics.- Elsevier Health Sciences, 2016, 424 p.
3. Charles J. Burstone, Kwangchul Choy. - The Biomechanical Foundation of Clinical Orthodontics. – e-book - 2020 г.
4. KALEY ANN.- Evidence-Based Orthodontics.- American Medical Publishers.- 2022, 225p.
5. Bhalajhi SI., et al. “Orthodontics: The art and science”. Sixth edition. Arya (Medi) Publication (2015)
6. William R Proffit., et al. “Patient Interaction in Planning”. In: Contemporary Orthodontics Elsevier Ltd (2019): 138.

7. Ramy Ishaq. "The Orthodontic Patient: Examination and Diagnosis". EC Dental Science 18.5 (2019): 975-988

8. 3D Diagnosis and Treatment Planning in Orthodontics: An Atlas for the Clinician 1st Edition ed. by Jean-Marc Retrouvey (Editor), Mohamed-Nur Abdallah (Editor) 2021.

Information resources

1. Державний Експертний Центр МОЗ України <http://www.dec.gov.ua/index.php/ua/>
2. [Laura Mitchell](#), «An introduction to orthodontics», 2013 – 336 p.
3. Національна наукова медична бібліотека України <http://library.gov.ua/>
4. Національна бібліотека України імені В.І. Вернадського <http://www.nbuv.gov.ua/>

Practical lesson №7

Topic: Complications during treatment with fixed appliances. Violation of fixation of braces. Their analysis and methods of elimination

Purpose: To learn the classification of devices, to know the types of devices, their structure, the principle of action and their role in the treatment of SCA. Master the skills of forming the final diagnosis of orthodontic patients and be able to prescribe appropriate orthodontic treatment with the help of devices in different age periods.

Basic concepts: Anatomy and physiology of a child's ADHD, physiological and pathological bites, classifications of orthodontic devices, facial muscles, masticatory muscles.

periodontium, alveolar processes, jaw bones, TMJ structure in children of different ages.

Equipment: Gypsum models, TRH, orthopantomograms, removable and non-removable orthodontic appliances for the upper and lower jaw, typodont.

Plan

1. **Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).**
2. **Control of the reference level of knowledge (written work, written test, frontal survey on basic terminology, etc.)**
3. **Questions (test tasks) to check basic knowledge on the topic of the seminar:** - to know the indications and contraindications for using the brace system in children of different ages

- biomechanics of tooth movement in three mutually perpendicular planes; what morphological changes occur in periodontal tissues during tooth movement; biomechanics of horizontal tooth movement according to Kalvelis;
- to know the anatomical and physiological features of the structure of the chewing apparatus;
- to know the features of the structure of the maxillofacial area and TMJ
- to be able to characterize temporary and variable bite
- to know the peculiarities of TMJ structure in children of different ages

4. Discussion of theoretical issues:

All over the world and in Ukraine, there is a tendency to increase the prevalence of maxillofacial anomalies, and to increase the number of complications arising from hardware treatment. Among the most common complications are caries, gingivitis, and periodontal disease. The occurrence of complications in the orthodontic treatment of maxillofacial anomalies in children can be associated with insufficient oral hygiene during treatment, microbial dysbiosis, violation of the biochemical composition of the oral cavity, inefficiency of local immunity, allergic response to the action of component hardware structures, intolerance to their metal inclusions, and as well as the patient's individual genetic profile.

Early prognostic markers are necessary to prevent complications during orthodontic treatment of maxillofacial anomalies in children.

The main mistakes that are made when fixing braces on the crowns of teeth are as follows: 1. Poor mechanical cleaning of the enamel with the help of an excavator, a hook for removing tartar, a brush with applied abrasive material. After the orthodontist is convinced that the patient regularly brushes his teeth, before gluing the parts, each tooth should be thoroughly cleaned of plaque and tartar. If the patient used toothpaste containing fluorine, it is advisable to postpone the strengthening of braces for 1 month

2. Ignorance of the method of working with composite materials for the purpose of gluing braces and other devices to tooth enamel

3. Insufficient etching of the tooth enamel with phosphoric acid (less than 20-30 seconds for the initial gluing of the bracket, less than 10 seconds for the second one). Etching with phosphoric acid should ensure minimal dissolution, enamel prisms and maximum removal of surface organic substances, the formation of a sufficient area of enamel for connection with the composite material 4. Excessive etching of the tooth - more than 100 seconds, which can cause significant changes in the enamel structure

. Etching of the entire vestibular surface of tooth enamel, not just the area where the bracket will be fixed.

6. Insufficient washing of each tooth with water after enamel etching with phosphoric acid. First, you should remove the acid residues with a cotton swab, then rinse the enamel with a strong stream of water for 60 seconds.

7. Insufficient drying of the tooth enamel before gluing the bracket - water and oil particles hitting the enamel with an air jet.

Common mistakes when positioning braces. When positioning braces, there are mostly three groups of problems:

– vertical errors

– axial errors (parallelism errors)

– horizontal errors Vertical errors:

Placing brackets too gingivally or too incisally/occlusally is probably the most common error in bracket positioning. The first reason is that the tooth is often undercut when the braces are fixed. If this happens, the orthodontist must determine where the center of the clinical crown would be if the tooth had erupted completely.

Horizontal errors:

Horizontal errors occur when the bracket is positioned too mesially or too distally from the vertical axis of the clinical crown. Small errors in the horizontal positioning of the bracket can have a significant negative effect on the rotation of the teeth. If the labial (buccal) surface of the tooth is highly curved, such as a canine, it is especially important to examine the tooth from the buccal and occlusal sides, which helps to determine the vertical axis of the clinical crown

Axial errors (parallelism errors):

Violation of the parallelism of the long vertical axis of the tooth is probably the second most frequent error when positioning braces. This error usually occurs when the vertical axis of the tooth is incorrectly determined, and therefore incorrectly determines the course of the vertical wide groove of the bracket.

If there are doubts about the determination of the long vertical axis of the clinical crown, you can easily draw a pencil across the labial (buccal) surface of the clinical crown. This will "highlight" the most protruding part. One of the mistakes in orthodontic practice is gluing a bracket on a tooth that does not correspond to it, in case the patient loses the bracket, it is peeled off. Crowns of teeth belonging to different functional groups of the upper and lower jaws have different sizes, shapes and curvature of the vestibular surface. In this regard, the braces for the teeth of the upper and lower jaws of the right and left sides differ from each other.

Arbitrary selection of the bracket does not ensure its strong fixation on the tooth with the help of composite material. It is necessary to choose a bracket designed

for a specific tooth of the corresponding jaw and side of the dentition. In case of urgent need, it is permissible to glue braces intended for canines and premolars of the upper jaw on the right to similar teeth of the lower jaw on the left. And vice versa, braces intended for the canines of the upper jaw on the left - on similar teeth of the lower jaw on the right and vice versa.

Correctly fixed braces:

- tightly adhere to the surface of the teeth,
- there are no excess glue on the edges of the base, which later turn brown and cause gum irritation, especially at the point of contact - there are no gaps between the tooth and the base of the bracket
- do not interfere with occlusion.

5. Topics of reports/abstracts

Morphological changes occurring in the tissues of the tooth-alveolar complex during tooth movement

- The value of the force of the movement of the teeth. Complication.
- The main properties of materials for the manufacture of braces and components for the brace system.

6. Summarizing the information received at the lesson.

7. List of recommended literature:

Main:

1. Lectures on the relevant topic.
2. Flis P.S. et al., Orthodontics: a textbook for students of stomatological faculties of higher medical educational institutions of IV level of accreditation - Kyiv, 2019, 305p.
3. Golovko N.V.-Orthodontics.-Poltava.-2015. - with. 128-132.
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