UKRAINIAN MINISTRY OF HEALTH
Odessa National Medical University

Dentistry Faculty
Department of orthodontics

APPROVED
Vice-rector for scientific and pedagogical work
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GUIDELINES
For practical lesson
From the academic discipline

Dentistry Faculty, course 3
Academic discipline – Roentgenological method of inspection in orthodontic

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

Topic: Concept of norm in orthodontics. Morpho-functional characteristics of temporary, mixed and permanent bite.

Goal: To master the stages of development TMJ, anatomical and physiological characteristics TMJ child in different age periods. To master the material about the formation of jaw bones in different age aspects. To be able to name the morphofunctional characteristics of temporary, mixed and permanent bite.

Basic concepts: student of the Faculty of Dentistry must master the educational material on the stages of development of the PDA, the anatomical and physiological features of the PDA of a child in different age periods. The student must be able to determine the risk factors for the occurrence of dental-jaw anomalies, taking into account the age of the child.

Equipment: cephalometric analys, plaster models, typodonts, panoramic x-rays.

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:**

1. Embryonic development of the dento-jaw apparatus
2. Features of the structure of the oral cavity of the newborn

3. What are the structural features of the temporomandibular joint in a newborn child?
4. The act of sucking a newborn
5. The act of swallowing a newborn
6. Terms of formation and eruption of milk teeth

4. Discussion of theoretical issues:

The characteristics of the growth and development of a child largely
depend on the properties and characteristics received by her from her parents. But there are some patterns of growth and development that are common to most children. According to the nature and intensity of the changes that occur in the body, it is customary to distribute human development over the appropriate periods.

Among the numerous classifications of human ontogenetic development,
the most common is the modified classification of M.P. Gundobin. A. Intrauterine stage: the phase of embryonic development (II-III months); phase of placental development (from III month to birth)

B. extrauterine stage: neonatal period (up to 3-4 weeks); period of infancy (from 3-4 weeks to 12 months); Preschool (senior nursery) period (from 1 year to 3 years); preschool period (from 3 to 6 years old); junior school period (from 7 to 11 years old); senior school period (from 12 to 17-18 years old) .

After birth, a person's life, according to the WHO classification, is distributed by age as follows: Newborns - 1-10 days Breast age - 10 days - 1 year; Early childhood - 1-3 years; First childhood - 4-7 years

Second childhood - 812 years old (boys) 8-11 years old (girls)
Adolescence -13-16 (boys), 12-15 (girls)
Adolescence -17-21 (boys)), 16-20 (maidens) Mature age I period 22-35 (h), 21-35 (w) II period 36-60 (h), 36-55 (w) Summer age- 61-74 (h) , 56-74 (f) Senile age -7590 (h and w) Long-livers - 90 years and older.

L.P. Zubkov and F. Ya. Khoroshilkina (1993) to perform the main tasks of prevention, 10 periods of the formation of the dentoalveolar system are determined, taking into account its physiological, morphological and functional changes I intrauterine development of the embryo and fetus (formation of tissues and organs of the dento-maxillofacial system);

II - from birth to 6 months (before the eruption of the first temporary (milk teeth)
III - from 6 months to 3 years (the formation of a temporary bite)
IV - from 3 to 4.5 years (temporary bite is formed) 5
V - from 4.5 to 6 years (the aging period of the temporary bite)
VI - from 6 to 9 years (the first period of mixed bite)
VII - from 9 to 12 years old (second period of mixed bite)
VIII - from 12 to 15 years old (permanent bite)
IX - from 15 to 21 years (completion of the formation of a permanent bite) X - from 21 to 40 years old (active function of the dentition);
X and - from 40 or more (decreased function of the dentition).

Since the child is constantly growing and developing and at each age stage of his life appears in a special morphological, physiological and psychological quality, a certain need arises to distinguish a number of periods or stages of development in the process of human ontogenesis. Among the stages of ontogenesis, two are important: intrauterine or antenatal development and postnatal, or childhood. The prenatal period is primarily characterized by morphogenesis, which embodies the organogenesis of various body systems, which is manifested by very sharp and significant changes in the shape and structure of organs with extremely intensive and differentiated growth .

The intrauterine stage from the moment of conception to birth lasts an average of 270 days.

It is customary to distinguish several periods of intrauterine development:

1. germinal, or the actual embryonic period. It begins from the moment of fertilization of the egg and ends with the implantation of a blastocyte formed in the lining of the uterus. Its duration is 1 week.
2 Period of implantation. Lasts about 40 hours, that is, about 2 days. These two periods are sometimes combined, since their medical and biological significance is great. At this time, 50-70% of fertilized eggs do not develop, and teratogenic factors, especially those of the strong group, cause pathology incompatible with the survival of the embryo (aplasia and hypoplasia), or form severe malformations due to chromosomal aberrations or mutant genes.
3 Embryonic period. It lasts 5-6 weeks. The embryo feeds from the yolk sac. Its most important feature is the establishment and organogenesis of almost all internal organs of the unborn child. Therefore, the action of teratogenic factors (exogenous and endogenous) causes embryopathies, which are the most severe anatomical and dysplastic malformations. The age of the fetus is from 3 to 7 weeks. considered to be a critical period of development .
4 Neo-fetal, or embryo-fetal period. Lasts 2 weeks. When the placenta is formed, it coincides with the end of the formation of most organs (except for the central nervous and endocrine systems). This period is important, since the correct formation of the placenta, and therefore the placental circulation, determines the further intensity of fetal growth.

5. Fetal period. Lasts from 9 months. before birth. It is characterized by the fact that the development of the fetus is provided by hemotrophic nutrition. In the fetal period, there are two sub-periods: early and 6 later. The early fetal period (from the beginning of 9 weeks to the end of 28 weeks) is characterized by intensive growth and tissue differentiation of fetal organs. The action of unfavorable factors, of course, no longer leads to the formation of structural defects, but it can be manifested by a delay in the growth and differentiation (hypoplasia) of organs or a violation of

tissue differentiation (dysplasia). Since the immune system is just beginning to form, the response to infection is expressed by tissue proliferative reactions, which lead to cirrhosis and fibrosis. However, the birth of an immature, premature baby is possible. The totality of fetal changes that occur during this period

is called the general term - "early fetopathies".

6. The late fetal period begins after 28 weeks of gestation and continues until the onset of labor. The defeat of the fetus in this period no longer affects the processes of organ formation and tissue differentiation, but can cause premature termination of pregnancy with the birth of a small and functionally immature child. If pregnancy persists, fetal malnutrition (intrauterine malnutrition) or general underdevelopment, that is, insufficient weight and body length of the newborn, may occur. The peculiarity of the damaging effect of the infection in this period is the absolutely definite specificity of the damage, that is, the emergence of an already present infectious process with morphological and clinical signs of the disease characteristic of this type of pathogen. Finally, the late fetal period provides the process of deposition of many nutritional components that cannot be introduced to a child in sufficient quantities with breast milk. Thus, the deposition of calcium, iron, copper and vitamin B12 salts can maintain an infant's nutritional balance for several months . In addition, in the last 10-12 weeks of pregnancy, a high degree of maturity and protection of the functions of the vital organs of the fetus from possible violations of oxygenation and trauma during childbirth is achieved, and the mother's immunoglobulins accumulated during transplacental transmission provide a high level of passive immunity. In the last weeks of pregnancy, the maturation of the "surfactant" is also carried out, which ensures the normal function of the lungs and epithelial tissues of the respiratory and digestive tracts. Therefore, the birth of a child, even with a relatively low degree of prematurity, has a very significant effect on the adaptive capabilities and the risk of a wide variety of diseases. The late fetal subperiod, naturally, passes into the intrapartum stage, which is calculated from the day of the appearance of

regular labor pains until the moment of cord ligation. At this time, the occurrence of injuries to the central and peripheral nervous system is possible, creates an immediate threat to life. In addition, severe cases of impaired umbilical circulation or breathing are possible. The conditions for maturation and development are of exceptional importance, since the nutrition of the body, intensively develops, occurs at the expense of the mother.

The embryo, at the same time, develops, and the fetus is very sensitive to adverse (teratogenic) factors that can cause death (abortion, stillbirth), malformations from severe, incompatible with 7 life, in lungs developmental anomalies, as well as functional disorders that may appear immediately after birth or later (sometimes years and decades). In the embryo at the age of 12 days, a small depression of the ectoderm is formed between the anterior cerebral bladder and the heart protrusion, which is called a cavity cavity, or oral fossa. Gradually deepening, the oral fossa reaches the blind end of the anterior intestine from which it is separated by the pharyngeal membrane. The pharyngeal membrane consists of the leaves of the ecto- and endoderm adjacent to each other. At the end of the 3rd week, the pharyngeal membrane ruptures and the anterior intestine begins to connect through the oral fossa with the external environment. At about the same time, two small depressions are formed on the sides of the main section of the embryo - the first and second external, branchial or pharyngeal slits, and by the end of the 1st month, the third and fourth branchial slits appear, which are located caudal to the first two.

Between the gaps, due to the growth of the mesenchyme, thickenings are formed, which are called the branchial or pharyngeal arches. The first arch, which is located cranially from the first branchial cleft, is called the jaw. The second arch, which is located between the first and second branchial clefts, is called the sublingual. At the end of the first month, the oral fossa is limited by 5 hills, or iedus. One of them (frontal) is located above the oral fossa, two maxillary ones are on the sides of it, and two mandibular ones are slightly lower than the previous ones. These processes are elements of the first branchial arch.

In the process of further development, the mandibular processes approach and grow together along the midline and form the lower jaw and lower lip. The maxillary processes grow together with the mandibular processes in the lateral regions and form the cheeks and

lateral regions of the upper jaw and upper lip; however, they do not reach the midline. The end of the frontal process descends into the space between them, from which the nasal processes depart, I limit the nasal openings, and the middle part of the frontal process forms the nasal septum followed by the incisor bone and the middle part of the upper lip. Thus, the entire upper part of the face (forehead, eye areas and nose) is formed from the frontal process; lower - of two mandibular. In the middle part of the face, the lateral sections are formed from the maxillary processes, and the entire middle section from the frontal process. The formation of the face, the fusion of the processes that form it, ends at the seventh week of intrauterine development. Violation of the fusion processes leads to the occurrence of congenital malformations of the face. The development of the oral cavity is associated with the development of the nasal cavity. At first, both cavities are separated from each other by the primary palate. The primary palate is formed by the medial process, which from the side of the oral cavity merged with the maxillary and lateral nasal processes, which go around the bottom of the olfactory fossa.

From the tissue of the primary palate are formed: the middle part of the upper lip within the FILTRUM (philtrum) the middle part of the upper jaw, which contains the

incisors and the anterior part of the hard palate (intermaxillary incisor bone) Later, at the beginning of the 2nd month of the prenatal period, the final palate develops. It is formed from lamellar outgrowths on the inner surface of the maxillary processes (they are called palatine processes), which grow towards each other and merge along the midline with each other and with the nasal septum, which descends from above. The posterior parts of the palatine processes, which have no connection with the nasal septum, merge to form the soft palate and uvula. In the process of forming the anterior part of the final palate, a part of the primary palate with the palatine papilla is included in it. The palate is separated from the lip and cheeks by a narrow arcuate groove - the primary labial groove. There is such a groove on the lower jaw. From both furrows, an epithelial plate grows into the depth, which is divided into two: external and internal - dental.

Between them, the mesenchyme grows, which forms protrusions - the alveolar process. Thus, the anterior part of the upper lip and upper alveolar process develops from the primary palate. As a result of the

splitting of vestibular plastics, the labial groove deepens, and the vestibule of the oral cavity is formed between the lip and cheek on the one hand and the alveolar process on the other. At first, a very wide mouth opening gradually decreases due to the fusion in its lateral parts of the upper and lower lips. At the same time, the cheeks are formed, in which the sebaceous glands can be stored along the fusion line.
The tongue comes from the first three branchial arches. At the end of the 4th week of intrauterine life on the oral surface of the first (jaw arch there are three elevations: in the middle there is an unpaired tubercle and on the sides there are two lateral ridges. They increase in size and merge to form the tip and body of the tongue. Later, from thickenings to the second and partly to the third and branchial arch develops the root of the tongue with the epiglottis. Draining of the root with other parts of the tongue occurs at the 2nd place of drainage, a groove remains, which is called the terminal (sulcus tenninalis). The muscles of the tongue develop from myotomes. The masseter muscles themselves are formed from the first 10 branchial arch. Development of salivary All glands of the oral cavity are derivatives of stratified squamous epithelium. Previously, everything is in the embryo: the ocular gland is laid (on the fourth week), then - the submandibular (on the sixth week) and sublingual (on the 8-9th week). glands become noticeable in the mucous membrane much later.The formation of the tonsillar apparatus of the pharynx begins at the 3rd month of embryo rional period. After the completion of the formation of soft tissues, the formation of bone structures begins. The bones of the facial skull, which are directly related to the oral cavity, are integumentary (bones of connective tissue origin). The laying of future jaws begins at a relatively early stage in the formation of a face in a human embryo. For the first time, the anlage of the upper jaw appears in the pre-fetus with a length of 20 mm in the form of a skeletal accumulation of mesenchymal cells. One of the first bones of the facial skull to ossify is the upper jaw. By the end of the 2nd month of intrauterine development, when the growth of the maxillary and frontal processes, which form the middle part of the face, is completed, six ossification nuclei appear in their thickness; mineralization begins with them, first of the palatine processes and lateral sections of the upper jaw, and somewhat later of its central area in the form of an independent incisor bone, which only later grows together with the maxillary bones. The upper jaw refers to the bones that are formed on the basis of the

connective tissue, bypassing the stage of cartilage. The development of the lower jaw begins with the formation of bone tissue from several points of ossification located in the tissue adjacent to the Meckel's cartilage. The cartilage itself is reduced, giving way to the body of the lower jaw, and develops. The posterior parts of the jaw, its branches, are formed independently of Meckel's cartilage from the corresponding points of ossification. Ossification of the two halves of the lower jaw ends with their fusion, that is, the lower jaw turns into an odd bone after birth until the end of the first year of life. The alveolar process of the jaw develops from the mesenchyme, which limits the tooth bud. The laying of the alveolar process of the lower jaw occurs at the 3rd week of intrauterine development, the upper jaw at the 4th week. The growth of the alveolar process with the body of the lower jaw occurs up to 1 month, on the upper jaw - up to the 3rd month. With the end of the eruption of teeth, the formation of the alveolar edge also ends, and with the end of the formation of the root, the formation of its base. In the thickness of the forming jaws, the rudiments of teeth are formed and developed. The growth and formation of the jaws are closely related to the development and eruption of teeth. As described above, the face develops as a result of the fusion of different processes. However, their complete connection does not occur - in the 11th site of their confluence, the mesenchyme of one process is separated from the other by a groove - a zone that has a small number of cells. During development, these grooves are smoothed out, due to which the final configuration of the face is formed.

Teeth development.

The following stages of development of temporary permanent teeth are distinguished: 1. The formation and formation of tooth buds.

2. Differentiation of primordial cells.

3. Histogenesis of dental tissues.

4. Mineralization.

5. Teething.

In the seventh week, when the embryo becomes human-like and the term "embryo" is changed to the term "fetus", a thickening appears along the lower and upper edges of the primary oral cavity: stratified squamous epithelium, which grows into the underlying mesenchyme and forms the dental plate. which grows in depth acquires a vertical position. On its edge, bulbous growths of the epithelium appear, which take the form of caps, they are called enamel organs. In each jaw there are 10 such

growths, which correspond to the number of the following temporary teeth. The concave part of the caps is made by mesenchyme, which forms The so-called dental papillae.The mesenchyme that limits each such tooth germ, located in the form of a special layer, which is called the dental bag.The cells of the enamel organ in the process of its development acquire various shapes.The epithelium, which forms the inner surface of the cap (internal epithelium), becomes cylindrical kim. The outer surface of the cap is covered with small cells of the outer epithelium. Located between the outer and inner layers of the epithelium, the cells acquire a stellate appearance and are called the pulp of the enamel organ.

But only those cells that are adjacent to the inner layer of the epithelium remain small, round or oblong, forming an intermediate layer of the enamel organ. The cells of the inner and partially intermediate layers of the organ form enamel and get the name adamantoblasts, or ameloblasts. The papilla gives rise to the development of dentin and pulp. Cement and periodontium develop from the mesenchyme of the dental sac. The deepening of the cap of the enamel organ determines the shape of the tooth. This applies not only to the crown, where the enamel epithelium forms the enamel, but also to the tooth root. In the place of transition of the inner epithelium to the outer, both layers of the epithelium grow inward and form the so-called hertvig's vagina, which seems to be a form for the formation of dentin, from which the main part of the tooth root is built. Dentin begins to form at the apex of the papilla even when the bud is small; the enamel of the tooth also develops there. Starting in the area of the apex of the papilla, the formation of the tooth gradually spreads to the lateral regions towards the next apex of the root.

Even before the onset of dentin deposition outside of the tooth sac, bone tracts of the future 12 tooth cell are formed. The formation of dental crowns (mineralization) begins with the central incisors at the end of the 5th month of embryonic development, and then - the distally located tooth buds. Since the processes of formation of organic matter of teeth can be assessed only on histological preparations, the development of teeth is judged by the processes of mineralization, which begin a short period of time after the formation of the basic substance of enamel and dentin.

It is possible to investigate only using X-ray studies. From the moment of birth until the age of 14-18, significant changes occur in the

body, which are due to its growth. In turn, these changes determine the anatomical and physiological characteristics of the growing organism. These features are most pronounced in newborns and infants.

FEATURES OF THE STRUCTURE OF THE FACE AND Oral cavity of the NEWBORN

The proportions of the face of a newborn and an adult are different. This is mainly determined by the ratio of the sizes of the cerebral and facial parts of the skull. The chair of the newborn is large and is 1/4 of its body length. The skull of a newborn is marked by the small size of the facial region compared to the brain. As a result, the facial region hardly protrudes forward. The cerebral part of the skull increases significantly less than the facial one. Another feature of the newborn's skull is the presence of fontanelles. They are located at the intersection of the sutures, where the remains of the connective tissue are preserved. Having them is important as it allows the bones of the skull to move during childbirth. All fontanelles overgrow 2-3 months after birth, except for the frontal (in the second year of life).

Air cavities (maxillary, etc.) in the bones of the skull have not yet developed. Due to the weak development of the muscles, which have not yet begun to function, various muscle tubercles, ridges and lines are poorly expressed. In a newborn, there is a disproportion between the middle and lower part of the face, due to the fact that the height of the bite is provided only by the gingival rollers.

The nose of the newborn is relatively small, the nasal passages are narrow. The subcutaneous fat layer is located fairly evenly and gives the child's face a characteristic roundness and fullness. In the thickness of the cheeks, there are fatty pads, the so-called Bisha lumps. The fatty layer of the cheeks is an independent bag of the body, which is contained in its own capsule. Both anatomical structures facilitate sucking. The upper lip prevails over the lower lip, forming a lip rung. The lips of the newborn are soft, swollen, proboscis, transversely divided (PfaundlerLyushka rollers) with a sucking pad on the upper lip, due to this, the baby tightly covers the nipple.

Deep labio-chin furrow, chin sloping back. Among the factors that contribute to sucking also belongs to the physiological children of retrogenia. At the same time, the distance between the tops of the

alveolar processes of the jaws in the sagittal plane reaches 5-7 mm, and the vertical slit is 2.5-2.7 mm, its absence determines the development of a deep bite.

The vestibule and floor of the oral cavity are small, transitional folds are poorly expressed. The tongue is big. The upper jaw consists of 2 symmetrical halves, which are combined with a longitudinal seam. During early embryonic development, the intermaxillary bone is located between both parts. Violation of embryonic development at 2 months of pregnancy leads to malformations of the face (crevice defects of the upper lip, alveolar bone, palate). The upper jaw of the newborn is wide and short, and consists mainly of the alveolar ridge, which is located just below the palate. Flat palate with well-defined transverse folds. On average, there are 4-5 pairs of transverse folds in the palate, 2 3 pairs of which extend from the palatine sagittal suture. The transverse folds create a roughness in the mucous membrane and contribute to the retention of the nipple during feeding. Haimor's cavity is only outlined and on the roentgenogram it looks like an oblong enlightenment. It lies medially relative to the alveolar process. The rudiments of the teeth are located almost under the orbit itself and are separated from it by a thin bone plate. The length of the upper jaw of a newborn reaches 25 mm, width - 32 mm (T.V. Sharova, I.
Rogozhnikov, 1991p.).

The lower jaw consists of 2 non-fused halves, which are combined with connective tissue. The alveolar process is better developed than the basal part. This is due to the presence of rudiments of temporary and permanent teeth. F.Ya. Khoroshilkina (1982) provides data according to which the distance from the edge of the gums in a newborn to the lower edge of the jaw is 20.2 mm. The mandibular canal has an almost rectilinear shape and is located close to the edge of the lower jaw. The branch of the lower jaw is almost undeveloped, and the articular process rises above the level of the alveolar process. The angle of the lower jaw averages 135 ° - 140 (EN Zhulev, 1995) (Fig. 27). Each jaw has 18 follicles, including 10 temporary and 8 permanent teeth (6321 + 1236). The rudiments of the permanent teeth on both jaws are located on the labial side, the rudiments of the permanent teeth lie deeper than the temporary ones on the lingual side on the lower jaw and from the palatine on the upper. The gingival membrane is a double crest-shaped fold of the mucous membrane in the frontal area of the upper and lower

jaws (Robin-Mazhit fold). It is rich in small papillary tubercles, blood vessels, as a result of which it is able to thicken. The gingival membrane has a large number of elastic fibers. This anatomical formation can be clearly seen immediately after the baby stops sucking during feeding. The sucking function is well developed in an infant. The mother's nipple irritates the reflexogenic zones of the oral cavity.

Excitation is transmitted along the afferent fibers of the n.trigeminus, which innervates the oral cavity, to the sucking center in the medulla oblongata. From the center, an impulse along 18 motor fibers (3 nerves: hypoglossal, triple and facial) leads to muscle contraction (sublingual - excites the muscles of the tongue; triple - chewing, lateral pterygoid and buccal muscles; facial - excites the muscles of the lips). Thus, the muscles that push the lower jaw forward are contracted, due to the contraction of the circular muscle of the oral cavity, the nipple is tightly covered by the lips, the tongue presses the nipple to the palate.

The temporomandibular joint (TMJ) is a complex joint, not only in terms of anatomical structure, but also in function. It belongs to paired, combined, incongruent joints. The temporomandibular joint on both sides (left and right) constitutes a closed circuit, because movement in one joint causes movement in the second. The joint is biaxial, movements in it occur in two directions: horizontal and vertical. The joint consists of the articular head of the lower jaw, the glenoid fossa of the temporal bone, the articular tubercle of the temporal bone, the articular disc, the capsule of the joint (joint capsule) and the articular ligaments. In a newborn child, the structural features of the temporomandibular joint are as follows: - the head of the articular process is almost rounded, has almost the same dimensions (transverse and anteroposterior), its forward inclination is not yet pronounced, the head is covered with a thick layer of fibrous connective tissue; - glenoid fossa, which is a receptacle for the heads of the lower jaw, rounded; it does not have an articular tubercle in front, but posteriorly there is a well-defined articular cone, which limits the movement of the lower jaw towards the middle ear and prevents the pressure of the head on the tympanic part of the middle ear; - the mandibular fossa functions completely, since the lower jaw is displaced distally (the state of physiological babies of retrogeny) - the articular head is located in the posterior part of the mandibular fossa; - the thickness of the bone of the

arch of the fossa is not much more than 2 mm; - the depth of the mandibular fossa is slightly more than 2 mm; - the intra-articular disc is a soft layer of a rounded shape, concave from below, and convex from above, with barely noticeable sweating from the front and back; - the disc consists mainly of collagen fibers; - there are no villi of the synovial membrane of the joint capsule. Absence of articular tubercle, occipital slope of an underdeveloped branch of the lower jaw, physiological retrogenia, a wide flat fossa, an intra-articular disc and an articular cone are formed, create favorable conditions for the movements of the lower jaw in the sagittal plane, which are necessary for the full flow of the sucking function.

5. **Topics of reports/abstracts:**
   1. How many periods of physiological bite increase exist?
   2. What externally facial features characterize an orthognathic bite?
   3. What signs characterize the orthognathic bite in the vertical plane?
   4. What features characterize the orthognathic bite in the transversal plane?
   5. What features characterize orthognathic bite in the sagittal plane ?

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 №2

Topic: Orthognathic bite, its characteristics. Physiological and pathological types of bites.

Goal: to study the concept of norm in orthodontics an orthognathic occlusion ,its chraracteristic ,Angle’s and Andrews’s keys.kinds of physiological and pathological bite of children .The periods of the establishment of a vertical dimension .Planes by L.J Boume and A.M.Schwarz

Basic concepts: in the process of mastering the material, the student must apply his knowledge about the features of the anatomy and physiology of the child's MFO, stages and timing of the development of temporary and permanent teeth. To master the topic, the student must use his knowledge and skills of methods of clinical examination of patients.

Equipment: cephalometric analys, plaster models, typodonts, panoramic x-rays.

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:**

1. Intraoral examination of a 5-years-old child revealed primary occlusion, tremas and diastemas, worn tubercles and cutting surfaces of teeth. The distal surfaces of the second lower molars are anteriory to the distal surfaces of the second upper molars. This stage of primary occlusion is called:

A. Aging
B. Stable occlusion
C. Eruption
D. There is no correct answer
E. Formation

2. A visiting nurse examined a newborn child. Examination revealed that lower face part is shorten, chin is retrodeviated, teeth are missing, lower jaw is retrodisplaced.

What is the name of such mandible position of a newborn?

A. Physiological infantile retrogenia

B. Mesial occlusion
C. Distal occlusion
D. Edge-to-edge occlusion
E. Physiological occlusion

3. An infant was born full-term with body weight at a rate of 3200 g and body length at a rate of 53 cm. It was the first physiological delivery. What position of child's mandible is usually observed after birth?

A. Physiological retrogenia
B. Open bite
C. Direct relation
D. Physiological progenia
E. Deep overbite

4.A child was born with body weight 3200 g and body length 53 cm, 9 points on Apgar score. It was the first physiological delivery. What position of child's mandible is usually observed after birth?

A. Physiological retrogenia
B. Central occlusion
C. Posterior occlusion
D. Direct relation
E. Physiological progenia

5. The 16-years-old boy came to the doctor with complains of his aesthetic. Objectively: vestibular inclination of the upper and lower teeth, with minor overlapping, in the lateral sides - neutral teeth correlation. What kind of bite can you diagnose?

A. Biprognatic
B. Direct
C. Orthognathic
D. Opistignatychny E. Deep

6. Parents of the child 1 –year-old complains with absence of teeth. Childbirth was uncomplicated. In anamnesis: pneumonia in early childhood and rickets disease. What number of teeth should be in this age?

A. 8
B. 12
C. 14
D. 16
E. 20

7. What form of dentition is correct in the period of temporary occlusion? A. Semicircle
B. Parabola
C. U-like
D. Saddle-headed
E. Semiellips

8.During the examination of newborn: the lower part of the face is shorter than the middle one, the teeth are absent, the lower jaw is displaced back. What is the number of teeth in each jaw of a newborn?
A. 18
B. 12
C. 10
D. 16
E. 14

4. Discussion of theoretical issues:

Optimal individual norm" in orthodontics is defined as a state of morphological, functional and aesthetic balance in the dentition and in the facial skeleton as a whole, which is sufficiently guaranteed for a long time, which must be achieved in the process of orthodontic treatment (Yu.M. Malygin, 1979). It is characterized by extraoral and intraoral signs.

Extraoral signs . Facial - characteristics of the skin, proportionality of the face, symmetry of the face. Jaw - correct branch and body of the lower and upper jaw, angle value.

Intraoral signs - closing of the dentition - bite. The norm is an orthognathic bite, which ensures the optimal functioning of the dentoalveolar apparatus.

Description of facial features is of great importance for determining an aesthetic prognosis of treatment. Therefore, it is necessary to know the descriptive characteristics of the face with a physiological bite.
The face is divided into wide, medium and narrow in shape. In addition, they can be round, square, oval, triangular, frustoconical, or hexagonal. Studying the profile, they distinguish between medium, convex or concave faces. Conventionally, the face is divided into three parts: upper, middle and lower, which are formed as a result of drawing horizontal lines:

- upper - passes through the brow points; • middle - passes through the pidnose point;
- lower - through the lower part of the chin.

According to the physiological bite, the middle and lower parts of the face are almost equal. The bridge of the nose is of the usual form, movable wings of the nose. The upper lip prevails over the lower lip , forming a "lip rung". The lips are closed without tension, the labio-chin sulcus is of medium depth. The angle of the lower jaw is within 117-124 ° in adults. The physiological asymmetry of the face is determined (up to 2 mm).

Physiological types of bite.

- orthognathic
- straight
- physiological biprognathia
- opistognathia

All these bites have the same signs of closure in the area of molars and premolars and different ones in the area of incisors and canines.

Physiological occlusion characterizes morphological signs, some of which relate to the entire dental arch, others - only the ratio of the anterior teeth or posterior teeth.

Signs that apply to the entire dental arch:

The upper dental arch is semi-elliptical, the lower is parabolic.

2. On the upper jaw the dental arch is larger than the alveolar arch, the alveolar arch is larger than the basal one. On the lower jaw, the dental arch is smaller than the alveolar arch, and the latter is smaller than the basal one. Therefore, the upper dentition overlaps the lower one, and in the complete absence of teeth, even with a slight degree of atrophy of the alveolar processes, the upper jaw is smaller than the lower one.

3. Each tooth is usually joined with two antagonists, with the exception of the upper third molars and lower central incisors. The teeth of each dentition are adjacent to each other, touching the contact points located on the proximal surfaces.

2. The height of the crowns of the teeth gradually decreases, starting from the central incisors and ending with the molars (with the exception of the canines).

3. The upper teeth are located with the crown tilted outward and the roots inward; and the lower ones, on the contrary, are tilted by the crowns orally, and by the roots outside.

Signs that concern the front teeth :

1. The midlines, which run between the central incisors of the upper and lower jaws, lie in the same sagittal plane and are a continuation of each other.

2. The upper incisors overlap the lower ones by 1/3 of the crown height. The lower incisors with their cutting edges are in contact with the dental tubercle on the palatal surface of the upper incisors.

Signs of chewing teeth closing in the buccal-palatal direction:

1. The buccal tubercles of the upper premolars and molars are located outwards from the similarly named tubercles of the lower ones, and the

buccal tubercles of the lower ones - inward from the similarly named tubercles of the upper ones, therefore the upper palatine tubercles fall into the longitudinal grooves of the lower teeth, and the lower cheeks into the longitudinal grooves of the upper teeth.

2. The lingual tubercles of the lower teeth are located inward from the same tubercles of the upper teeth.

The external (buccal) and internal tubercles of the chewing teeth on both sides of the upper and lower jaws are located at different levels. The cross section of the chewing teeth, which goes from right to left or in the opposite direction, is a transverse curve, convex at the bottom and concave at the top.

The upper dental arch is wider than the lower one by the size of the buccal tubercle, due to which the range of lateral movements of the lower jaw increases and the occlusal field expands.

Signs of occlusion of the chewing teeth in the anteroposterior direction:

1. The anterior buccal tubercle of the first upper molar is located on the buccal side of the first lower molar in the transverse groove between the buccal tubercles, and the posterior buccal tubercle is located between the distal-buccal tubercle of the first lower molar and the medial-buccal tubercle of the second molar.

2. The chewing surfaces of the lower teeth, from the premolars to the last molar, form a concave sagittal curved surface. The chewing surfaces of the upper chewing teeth also form a sagittal curve, but not concave, but convex, which follows the shape of the lower concave curve.

Orthognathic occlusion is characterized by a high aesthetic optimum, high indices of the chewing function, the best conditions for the formation of somatic swallowing and the full function of the tongue.

The second variant of the physiological bite is straight or orthogenic. It differs from the orthognathic one in that the cutting edges of the upper incisors do not overlap the lower ones, but are set in direct contact (in contact with the cutting surfaces). Physiological biprognathia - all

occlusal relationships are preserved, except for the frontal teeth - they have a vestibular slope with a slight overlap of the lower teeth by the upper teeth.

Opistognathia - the canines and incisors on both jaws are tilted into the oral cavity, the upper teeth overlap the lower ones at the level of the dental tubercles or by edge closure.

The bite is described in three planes : sagittal, transversal and vertical.

The mid-sagittal plane comes between the central incisors through the seam of the palate, the middle of the nose and divides the face into two parts. In this plane, it characterizes the location of the lower jaw relative to the upper in the anteroposterior direction (neutral, distal, medial). The frame's guideline for bite description is:

1. a) the presence of close contact of the incisors along the sagittal;
2. b) correct sagittal contact of the incisors, or reverse overlap; c) the presence of a sagittal slit (space between the incisors of both jaws); d) with the relation of the canines;

e) the ratio of the first permanent molars or other temporary molars. According to the physiological occlusion, the incisors have tight contact along the sagital or the sagittal gap does not exceed 2 mm; tearing the hump of the upper canine protrudes between the lower canine and the first premolar (permanent bite) or between the canine and the first temporary molar (temporary and variable bite), the anterior buccal tubercle of the upper permanent molar is located in the mid-humped groove between the anterior and posterior tubercles of the lower first permanent molar. The vertical plane runs parallel to the plane of the forehead from top to bottom and characterizes the presence of incisal contact, the depth of its overlap (normal, deep) or the absence of incisal contact. An overlap of up to 1/2 of the crown height of the lower incisor is considered normal.

Transversal plane (horizontal, lateral), perpendicular to the sagittal plane, touching the masticatory tubercles of the first permanent molars and premolars. In this plane, the lateral displacements of the lower jaw are determined. Guidelines for the description of the bite is the ratio of the buccal tubercles of the upper and lower chewing teeth. According to the physiological occlusion, the upper dental arch is larger than the lower one by the size of the buccal tubercle. Displacement of the lower jaw is judged for the mismatch of the bases of the frenum of the lips. The degree of displacement is recognized in relation to the crown of the lower central incisor.

The Angle key of occlusion is fssous- ugric contacts between the first permanent molars of the upper and lower jaw with the correct inclination of the longitudinal axes of these teeth to the occlusal plane:

- mesio-buccal cusps of the first molars of the upper jaw should be located in the intertubular figure of the molars of the lower jaw;
- the distal-buccal cusps of the upper molars should be in close contact with the distal-buccal cusps of the first molars of the lower jaw and with the medial slope of the buccal cusps of the second molars of the lower jaw.

In 1972, L. Andrews described 6 keys that characterize optimal occlusion. Key I - correct hump-fissure 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. Key II - correct angulation (mesiodistal tilt) in degrees of the longitudinal axes of the crowns of all teeth. it is characterized by the value of the

angle, which is formed at the intersection of the axis of the clinical crown of each tooth and the perpendicular to the occlusal plane.

Key III - correct torque (vestibulo-oral tilt of the crowns and roots of the teeth).

Key IV - teeth located in the dentition should not be axially returned.

Key V - the presence of tight contacts between the teeth of each dentition without diastemas and three. Key VI - the concavity of the Spee curve should not exceed 1.5 mm, which is considered the largest distance between the plane, adjacent to the cutting edges of the central incisors of the lower jaw with the protruding distal tubercles of the last permanent molars and the lowest occlusal surface of the posterior teeth. The shorter the dental arch and the longer the apical arch, the deeper the concavity of the Spee curve, which leads to an incorrect position of the teeth and a deviation of their longitudinal axes.

According to physiological types of bite, movements in the temporomandibular joint are carried out evenly, smoothly, without accompanying noise effects.

Stages of the physiological rise of the bite height :

Stage 1 - 2-2.5 years old child (the end of the eruption of all permanent teeth) Stage 2 - 6 years (eruption of the first permanent molars

Stage 1 - 12-13 years old (after complete replacement of temporary teeth with permanent ones)

Stage 2 - 18-25 years old (eruption and correct articulation of wisdom teeth).

Pathological types of bite

Bites, in which there is an abnormal position of individual teeth, deformations of the dental arches and their abnormal relationship (shift in the sagittal, vertical and transversal direction).

1.prognathic (distal)
2. progenich ECK s (medial)
3. open suspended ;
4. deep;
5.cross;
6. neutral bite with abnormal position of individual teeth.

Tsilinsky's symptom

The value of Tsilinsky's symptom is quite large in the formation of a permanent bite. This is a preventive symptom that prevents the development of sagittal malocclusion. It should be determined at the end of the third bite period to ensure correct eruption of the first permanent molars in a neutral ratio.

In the third period of temporary occlusion, due to uneven growth of the lower jaw, physiological abrasion of the tubercles of the teeth, the medial-buccal tubercle of the upper second temporary molar moves from the first to the second groove and the distal surfaces of the second molars form a sagittal site.

In the clinic, the Tsilinsky symptom is determined using a mirror and a probe. The cheek is pulled back with a mirror, the probe is inserted behind the distal surface of the upper second temporary molar and gradually moves to the second temporary lower molar. If the probe moves forward when moving, this indicates the presence of a medial ostip and, in the future, correct eruption of the first permanent molars. If the probe smoothly transitions from the upper second molar to the lower one or moves distally, this indicates distal eruption of the first permanent molar and the formation of a distal occlusion. **Boom e and Schwartz final planes**

Boom (1959) came to the conclusion that even with a pronounced abrasion of the deciduous teeth, the medial displacement of the lower jaw does not occur. He distinguishes two forms of temporary bite with respect to the final plane:

1. shape - when the line is straight, that is, the distal surfaces of 2 temporary molars are on the same plane;
2. shape - a broken line, when the upper molars hang over the lower ones, forming a mesial place.

According to the author, this is due to the different sizes of the 2 upper temporary molars. If the dimensions of the latter are less than 8.8 mm, the final line will be straight. In addition, the author speaks about the stability of the sagittal position of the jaws, thereby emphasizing that the treble between the teeth and the mesial step is nothing more than a physiological variant of the norm.

Most experts support his opinion and identify 2 variants of orthognathic occlusion in the time period: 1st - 3 intervals and 2nd - without intervals.

A.M. Schwartz identifies options in the ratio of the distal surfaces of the second molars in the temporary bite:

1.if the upper molar is smaller than the lower one - straight the line is that the crowns of the second temporary molars are the same size - there will be a medial step

2 . if the crown of the lower molar is larger, there will be a distal step.

5. Topics of reports/abstracts:

1. How many developmental periods does a milk bite have?
2. What physiological signs characterize milk bite at 5-6 years of age?
3. What are the periods of establishing the height of the bite.

4. What is the morpho-functional characteristic of the early mixed bite?
5. Morpho-functional characteristics of late mixed bite?

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 №3

Topic: Classifications of maxillofacial anomalies and deformations.

Goal: student of the Faculty of Dentistry must clearly master the classifications of dento-maxillofacial anomalies and deformities: Engl, Katz, Ilyina-Markosyan, Kurlyandsky, Kalvelis, Kalamkarov, WHO, Schwartz, Horoshilkin, etc., their advantages and disadvantages, commonalities and differences. The student must be able to form the final diagnosis of the orthodontic patient.

Basic concepts: in the process of mastering the material, the student must apply his knowledge about the features of the anatomy and physiology of the child's maxillary area, the stages and timing of the development of temporary and permanent teeth, the morphological and functional characteristics of temporary, removable and permanent bite, physiological and pathological types of bite, clinical methods of examining children with dental-maxillofacial anomalies and deformities ., filling out the medical history, forming a preliminary diagnosis, the role of auxiliary research methods in the differential diagnosis of dental-maxillofacial anomalies.

Equipment: cephalometric analys, plaster models, typodonts, panoramic x-rays.

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:

Classification E. Angle. Advantages and disadvantages.

Classification by A. Ya. Katz. Advantages and disadvantages.

A. I. Betelman's classification. Advantages and disadvantages.

Classification L.V. Ilyina-Markosyan. Advantages and Disadvantages.

Classification of V. Yu. Kurlyandsky. Advantages and Disadvantages

4. Discussion of theoretical issues:

The first attempts to scientifically substantiate malocclusion in the sagittal plane are associated with the name of Edward Engle (Engl A., 1889).

This classification is based on the mesio-distal relationship of the dentition according to the location of the first permanent molars. Angle called the ratio of the first permanent molars of the upper and lower jaws "the key of occlusion", considering that the first permanent molar on the upper jaw is a stable point - "punctum ficsum", taking into account which it is necessary to determine all anomalies associated with the displacement of the lower first permanent molars.

Angle class I includes malocclusion anomalies characterized by a deviation from the norm only in the frontal area in terms of both

individual and groups of teeth. As for the ratio of the first permanent molars, mesio-distal harmony is observed, that is, the mesial buccal tubercle of the first upper permanent molar is located in the intertubular groove of the lower first permanent molar from the buccal side. Engle distinguishes between 7 types of malposition of individual or groups of teeth:

1) labial, or buccal occlusion,

2) lingual, or palatal occlusion,

3) mesial occlusion (relative to the normal position of the tooth),

4) distal occlusion,

5) torto-occlusion,

6) infraocclusion,

7) supra-occlusion.

Class **II** anomalies are characterized by the distal location of the lower first permanent molar. The second class has 2 subclasses.

In class II, subclass 1 - the upper frontal teeth are inclined forward and are fan-shaped with intervals.

In class II, subclass 2 - the upper frontal teeth are tilted back and can overlap the lower ones for the entire height of the crown.

In both subclasses, the distal relationship in the lateral regions can be unilateral and bilateral.

Class II is characterized by the mesial location of the lower first permanent molar relative to the upper one of the same name. The medial relationship can be unilateral and bilateral.

Engle's classification has several disadvantages.

- malocclusion is determined only in one plane - in the sagittal one.
- the position of the first upper permanent molar cannot be stable, since it depends on the condition of the second temporary molar, because due to its premature loss, the possible displacement of the first permanent molar is mesial.
- Engle's classification can be used only in variable and permanent bite.
- Angle's classification does not take into account functional and aesthetic impairments.

In 1939 A. Ya. Katz proposed a classification that took into account the functional pathology of the masticatory muscles. Engle's classification was taken as a basis. All Katz anomalies are divided into 3 groups.

The first group includes anomalies with a violation of the functional norm only in the area of the frontal teeth. The reason for the development of such anomalies may be improper laying of anterior tooth buds, supernumerary teeth, early extraction of temporary teeth, sucking of fingers, and underdevelopment of the intermaxillary bone. During functioning, vertical movements of the lower jaw prevail. Clinical picture

It is characterized by the accumulation and obstruction of teeth in the frontal area, edema of the lower papillae and carious destruction of the lateral surfaces of the frontal teeth.

The second group of occlusion anomalies is characterized by such a deviation from the functional norm: according to the central occlusion in the region of the lateral teeth, there is a tubercle contact with a more pronounced anomaly - contact with inappropriate and non-variable antagonists. In the area of the frontal teeth, a deep bite is often observed, less often - the absence of incisal contact, which sometimes turns into an open bite. Along the anterior and lateral occlusions, the zhuvalnaya area changes significantly. Funktsiya zovnishnih krilopodibnih m'yaziv obmezhena for morfologichnoyu Budova vidpovidaє another KLAS for Englem, harakterizuєtsya nedorozvinennyam m'yaziv scho visuvayut
Lower schelepu.

The third group of anomalies includes such deviations from the functional norm: along the central occlusion, the entire lower dentition is bent forward; lateral lower teeth with pronounced anomalies overlap the upper ones with their buccal tubercles; the lower anterior teeth are located in front of the upper ones. Behind the lateral occlusion on the

balancing side, the same-named tubercles are set against each other, and on the working side - the lower lingual tubercles against the upper buccal ones. The chewing surface is significantly reduced. The function of extending the lower jaw takes precedence over other movements. Anterior occlusion is difficult. Etiology of abnormalities: impaired correlation of the neuroendocrine system; sucking fingers; childhood diseases and the shape of the maxillofacial skeleton. The clinical picture is characterized by protrusion of the lower lip and flattening of the upper, and in more pronounced cases - protrusion of the chin, manifestations of periodontitis in the region of the lower frontal teeth . The disadvantages include the fact that the theoretical provisions were based on empirical conclusions, since at that time there were no methods for studying the function of individual muscles. From a morphological point of view, the classification of **Ya.Ya. Katz** has the same disadvantages as Engle's classification.

According to **D.A. Kalvelis** (1957), dentoalveolar anomalies and malocclusion are distributed in terms of the convenience of a practical orthodontist. It is based on morphological changes, as well as some etiological factors. The disadvantages include the lack of data on functional and aesthetic disorders and the ratio in the lateral parts of the dentition.

Anomalies of individual teeth.

1. Abnormalities in the number of teeth:

a) adentia - partial and complete hypodontia; b) supernumerary teeth (hyperdontia).

2. Anomalies in the size and shape of teeth: a) giant teeth:

b) spiny teeth;

c) distorted teeth shapes;

d) teeth of Hutchinson, Fournier.

3. Anomalies of the structure of hard tissues of teeth:

a) hypoplasia of dental crowns.

4. Violation of the teething process:

a) premature teething;

b) Teething is delayed.

Anomalies of the dentition.

1. Violation of the formation of dentition:

abnormal position of individual teeth: a) labio-buccal teething;

b) palatal-lingual teething; c) mesial dentition;

d) distal eruption of teeth;

e) low position (infra-occlusion)

f) high position (supraposition) f) rotation of the tooth (tortoanomalies) g) teeth transposition; h) dystopia of the upper canines. i) crowded teeth ,

d) tremas m ezhdu teeth (di astema).

Anomalies in the shape of the dentition: a) narrowed dentition;

b) saddle-like squeezed dentition;

c) V-shaped dentition;

d) the quadrangular shape of the dentition;

e) asymmetrical dentition. Anomaly uu bite .

1. Sagittal malocclusion .

1) drive me away ;

2) progeny : false and true .

2. Transversal anomalies and bite .

1) Narrowing of the dentition ;

2) discrepancy between the width of the upper and lower dentition in: a) violation of the ratio of the lateral teeth on both sides (bilateral cross bite);

b) violation ratio of lateral teeth on one side (or obliquesided cross minutes occlusion).

3. Vertical bite anomalies .

1) Chapters in Boki bite:

a) overlapping bite;

b) combined bite with prognosis;

2) open bite:

a) true bite

b) traumatic bite (due to bad habits).

Classification V.Yu. Kurlyandsky (1957). The classification is based on morphological changes in the bite. The classification did not find a reflection of anomalies caused by mesio-distal displacement of teeth and dental rejoices; displacement of the lower jaw.

1. Anomalies in the shape and location of the teeth.
    1. Anomalies in the shape and size of teeth.
    2. Anomalies in the location of individual teeth. Anomalies of the dentition.
    1. Violation of the formation and eruption of teeth: the absence of teeth and their primordia, supernumerary teeth.
    2. Retention of teeth.
    3. Violation of the distance between the teeth (diastema, three).
    4. Uneven development of the alveolar ridge, underdevelopment or overgrowth.
    5. The narrowing or widening of the dental series .
    6. Underdevelopment of the upper jaw .

7. Underdevelopment of the lower jaw .

Classification **AI Betelman (** 1965) - took into account malocclusion anomalies in three directions: sagittal, vertical and transversal; functional muscle pathology; clinical forms of distal and mesial occlusion; anomalies of individual teeth and dentition.

To sagittal malocclusion with A.I. Betelman belongs to the distal and mesial occlusion. Distal occlusion is characterized by a distal position of the lower jaw, as well as functional insufficiency of the muscles that push the lower jaw forward and the circular muscles of the oral cavity. On the mesial occlusion there is a mesial location of the lower jaw; the lower incisors overlap the upper ones; the muscles that push the lower jaw forward are overdeveloped, and those muscles that lower the lower jaw are underdeveloped.

Vertical anomalies include open and deep bite. By deep bite, insufficient development of the muscles that extend the lower jaw is determined, and when open, insufficient development of the pidnimachiv and circular muscle.

Two variants of oblique bite belong to transversal malocclusion:

And an option - on one side, the teeth are articulated as in orthognathies, and on the other, the upper jaw is compressed and the lower teeth in the lateral areas overlap the upper ones. In option II, the lower jaw is completely displaced to one side and, as a result, on one side of the palate, the surfaces of the upper lateral teeth overlap the cheek surfaces of the lower ones, and on the other, the lingual surfaces of the lower lateral teeth overlap the buccal surfaces of the upper ones, that is, the teeth are NOT in contact with chewing tubercles, but side surfaces.

An oblique bite is characterized by a functional failure of one of the locks, left or right, depending on which side the lower jaw is displaced.

In 1967, **L.V. Ilyina-Markosyan** , taking into account the influence of the function of the muscles of the oral and bilarotal areas on the formation and development of the dentoalveolar system, as well as the structural features of the temporomandibular joints, which, with the help of the chewing muscles, move the lower jaw in different directions, proposed a classification anomalies of bite, built on signs of displacement of the lower jaw during the closing of the teeth. This distribution was of great practical importance. All malocclusion

anomalies were divided into: sagittal, vertical and transversal anomalies. Each of the anomalies has From group:

- group A - without displacement of the lower jaw,
- group B - with a displacement of the lower jaw; Group C - combined forms with signs of groups A and B.

Instead of the terms “distal and mesial”, the terms “posterial and anterial” were proposed, which, in the author's opinion, more accurately determine the direction of the inconsistency in the ratio of the dentition.

1

The World Health Organization (WHO, 1968) in its systematization of diseases recommends the following classification of dentoalveolar anomalies:

Jaw size anomalies :

1.macrognathia of the upper jaw (syn. Maxillary

hyperplasia), 2. macrognathia of the lower jaw (syn.

Mandibular hyperplasia).

3. macrognathia of both jaws.

4. micrognathia of the upper jaw (syn. Maxillary hypoplasia).

5. micrognathia of the lower jaw (synonym of mandibular hypoplasia).

6. micrognathia of both jaws **.**

Anomalies in the location of the jaws relative to the base of the skull .

1. Asymmetry (except for hemifacial atrophy or hypertrophy, unilateral condylar hyperplasia).
2. Mandibular prognathia.
3. Maxillary prognathia.

4. Mandibular retrognathia.

5. Maxillary retrognathia .

Anomalies in the ratio of dental arches.

1. Distal occlusion.

2. mesial occlusion.

3. Excessive overlap (syn. Horizontal overlapping bite).

4. Excessive overbite (syn. Vertical overbite).

5. Open bite.

6. Crossbite of the posterior teeth.

7. Lingvoocclusion of the posterior teeth of the lower jaw.

Anomalies in the location of the teeth.

1 . Crowding (including tiling).

2 Moving.

3 Rotation.

4 Gaps between teeth (including diastema).

5 Transposition.

Undefined anomalies.

Clinical manifestations of anomalies in the development of teeth and jaws I. Deformations and changes in size (shortening or lengthening) of dental

1) in the sagittal direction (the entire dentition, any part),

2) in the transversal direction (on one side, on both sides),

3) in the vertical direction (the anterior part of the posterior part, the entire dentition).

II. Violation of the ratio of the dentition (bite):

1) in the sagittal direction:

- prognathic bite,
- the prognathic ratio of the anterior teeth,
- progenic bite,

- progenic ratio of front teeth.

in the vertical direction:

- deep bite, - open bite.

in the transversal direction:

- cross bite.

5. **Topics of reports/abstracts:**

Classification by A. Ya. Katz. Advantages and disadvantages.

A. I. Betelman's classification. Advantages and disadvantages.

Classification L.V. Ilyina-Markosyan. Advantages and Disadvantages.

Classification of V. Yu. Kurlyandsky. Advantages and Disadvantages .

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: X-ray examination methods: aiming X-ray, orthopantomography, X-ray of hand, computer tomography, MRI. Indications and contraindications.
Goal: the student must master the techniques of photometry of the head, be able to take photographs profile and face, know the basic anthropometric points and measurement parameters, be able to analyze the face and profile of an orthodontic patient, be able to study the proportions of the face.

Basic concepts: Know the anatomical formations on the face, point-like landmarks, be able to examine the patient's face, know how the face and profile are determined.

Equipment: cephalometric analys, plaster models, typodonts, panoramic x-rays.

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:

How to determine the width, depth, length of the face.

What indexes are used to characterize the shape of the head

How is the PT point determined according to the analysis of the teleroentgenogram for, Rickets?

What are the parts of Downs teleroentgenogram analysis?

What line is the reference line of the face in the analysis of the Downs teleradiograph?

What lines form the corner of the SeNB **?**

What angle determines the position of the upper jaw relative to the plane of the base of the skull **?**

What measurements are taken during craniometric examinations?

How is the nasion point determined when analyzing teleroentgenograms?

4. Discussion of theoretical issues:

Photometry is based on the regularities of the structure of the facial and cerebral parts of the skull, the proportionality of the ratio of different parts of the chairman and their relationship to certain planes.

The study is carried out on the patient's face, facial photographs and teleradiograms.

Photos are taken in the following projections:

• frontal, the lips are relaxed (if at rest there is no closing of the lips, it should be preserved)

• in the lateral projection, two pictures on the right and left **;** the frontal teeth are in maximum contact, the lips are closed. At the same time, lip tension is observed, such photos will clearly record its effect on the aesthetics of the face. Especially recommended for patients who do not close the lips at rest;

• frontal dynamic (with a smile) - while the patients purse their lips not as pronounced as those who laugh;

• magnified smile image for detailed smile analysis.

To characterize the size of the head and face, the following parameters are determined: width, height, length and depth. Bone support points are designated in capital letters, and soft tissue points - in lower case.

• The width of the chair is studied in its upper, middle and lower parts:

head width (eu-eu) - between laterally protruding points on the lateral surface to the left and right;

morphological width of the face (zy-zy) - between the most prominent points of the zygomatic arch on the left and right; width of the face (go-go) - between the lower points of the corners of the lower jaw on the left and right.

Head length (gl-op) - measured between the most prominent point on the lower part of the forehead along the mid-sagittal plane between the eyebrows and the most posteriorly protruding point of the occiput on the mid-sagittal plane.

The height of the head (tv) - is determined from the point on the tragus of the ears, perpendicular to the gl-op line to the most protruding point on the circumference of the head. Height of the face: morphological visota of the face (upper, lower , povna):

- upper (n-pr) - measured between point n, located at the intersection of the median plane with the nasal-frontal suture and the most anterior point of the alveolar ridge of the upper jaw;

- lower (pr-gn) - between the most anterior point of the alveolar ridge of the upper jaw and the junction point of the contour of the lower edge of the lower jaw and the outer contour of the symphysis; - full (n-gn) - between point n and point gn. physiognomic height of the face (tr-gn) - is determined between the point located on the sagittal plane on the border between the forehead and the scalp and the point gn.

The depth of the face is estimated from the point located on the tragus of the ear to points n of the skin, sn is the most posteriorly located point at the place of transition of the lower contour of the nose to the upper lip, pg is the most anterior point of the chin protrusion, gn is the junction point of the contour of the lower edge of the lower jaw and the outer contour symphysis.

To characterize the shape of the head and face, indices are used, which represent the percentage of some head and face sizes to others.

The shape of the head is determined by the transverse-longitudinal, height-longitudinal and height-transverse indices.

The transverse longitudinal index is the percentage ratio of the width of the head to its length. If the index value is less than 75.9 - dolichocephalic head shape, 76.0-80.9 - mesocephalic, 81.0 - 85.4 - brachycephalic, 85.5 and more hyperbrachycephalic.

Garson facial index - is determined by the percentage of the morphological height of the face to the width of the face in the area of the zygomatic arches. The following face types are determined by the index value: very wide, wide, medium, narrow, very narrow .

The morphological facies index Izard is equal to the percentage of the distance from the point of intersection of the midline of the face and the tangent to the superciliary arches to the point and tangent to the superciliary arches to the point gn of the point of the width of the face in the area of the zygomatic arches.

Size from 104 or more - narrow face, from 97 to 103 - medium, from 96 and less - wide face.

The face is examined from the front and the profile.

X-ray is a method of X-ray examination, in which a fixed image of the object under study is obtained using X-rays on a material sensitive to it (X-ray film). X-ray examinations are needed to clarify the diagnosis, determine the plan and prognosis of treatment, study the changes that occur in the process of the child's growth under the influence of therapeutic measures.

X-ray methods:

- intraoral;
- extraoral. **intraoral radiography is** indicated in the presence of diastemas, anomalies in the position of individual or groups of teeth, the presence of supernumerary or impacted teeth, to determine the degree of resorption of temporary roots and the stage of formation of the roots of permanent teeth.

An intraoral telephone X-ray can determine the following:

Intraoral phone radiography allows you to determine the following: Teeth adherence to the hourly chi post- bite.

- The degree of resorption of the roots of the temporary teeth .
- Presence, location, degree of formirova n and I foul lkula village toyannyh teeth

- The ratio of the follicle of the permanent tooth and the roots of the temporary .

A common way to study is to intraoral **radiography bite** or approx klyuzionnaya radiography , with the help of which you can get :

1. A section of greater length.
2. The presence and location of impacted teeth.
3. Condition of the palatine suture.
4. Presence of calculi of the submandibular and sublingual salivary

5. The presence of a fracture line in case of injury.
6. The presence of a fracture of the crown or root of the tooth during trauma.

Bite photography is done for examining children and adolescents with a violation of the opening of the mouth, as well as with increased sensitivity of the mucous membranes of the oral cavity, which leads to an increased vomiting reflex. **Radiograph of the palatine suture.** In cases when a narrowing of the upper jaw or its dental arch is diagnosed and expansion is planned, as well

as for the treatment of diastemas, radiography of the palatine suture is shown.

A more pronounced palatine suture is determined with a diastema . Its width and density often correspond to the size of the diastema. With a Diastema of small size, the palatine suture is of medium width and density, and with a diastema of 45 mm, it is wide and dense **.**

As follows the rapid expansion of the upper jaw by means of fixed orthodontic appliances sometimes there is an opening (gap) palatal suture. In such cases, a dark strip is visible on the radiograph in the region of the palatine suture, with moderate expansion of the gap is not observed. Sometimes only a slight depression of bone tissue or expansion of the gap between the roots of the central incisors is noted closer to the apex of the alveolar process.

In some cases, it becomes necessary to assess the sections of the upper and lower jaws of the temporomandibular joint, facial bones, the images of which do not appear on intraoral photographs or they are only partially visible. Extraoral images of teeth and surrounding tissues are less structural. Therefore, such pictures are used only in cases where it is impossible to obtain intraoral radiographs (increased gag reflex, trismus, etc.).

Extraoral methods of radiography include panoramic radiography, orthopantomography, tomography of the TMJ, and teleradiography. **Radiography of the lateral projection of the body and ramus of the lower jaw** . On extraoral radiographs of the body and branches of the lower jaw, it is possible to study the ratio of their sizes, measure the angle the lower jaw and the nature of the "wisdom" teeth eruption.

Panoramic X-ray of the jaws. On a panoramic radiograph of the upper jaw, an image is obtained of its dental, alveolar and basal arches, a ploughshare, nasal cavities, maxillary sinuses, zygomatic bones, on an radiograph of the lower jaw - a reflection of its dental, alveolar and basal arches, the edges of the lower jaw, angles and branches.

Compared to intraoral radiographs, the object-to-film distance is increased when obtaining a panoramic radiographic image. Thanks to this, valuable diagnostic information can be obtained due to the large area of view and the magnification of the image by 1.8-2 times. **Orthopantomography,** or panoramic tomography, provides a planar image of curved surfaces and capacious areas. Using this method, orthopantomograms are obtained, which can be used to study the degree of mineralization of the roots and crowns of the teeth, the degree of resorption of the roots of deciduous teeth and their relationship with the rudiments of permanent teeth, the inclination of the teeth erupted, and impacted teeth relative to the adjacent teeth and the median plane, the tooth-alveolar height in the anterior and lateral areas of the jaws, incisal overlap, asymmetry of the right and left halves of the face, middle and lower parts of the facial skeleton. **Radiography I TMJ.** An indication for the use of this method is the presence of complaints or symptoms from the TMJ in patients or the presence of a dentoalveolar anomaly associated with a displacement of the lower jaw (distal, mesial, cross bite).

Plain radiography of the temporomandibular joint is performed using the Schuller, Parma method.

The Parma method is a close-up contact survey that can be performed with a dental X-ray machine after the tube has been removed. Functional radiographs of the TMJ can be obtained using the Parma technique. For this, two images are taken with the mouth open and closed (for the closed teeth in the central occlusion

position). Such radiographs determine:

1. The position of the articular heads in the articular fossa.
2. The ratio of the articular heads and other elements make up the joint.
3. The width of the joint space.

Schuller method. To obtain an image of joints according to the Schuller method, the survey is carried out with a special tube 50 cm long.

tilting it at 30 °, the central ray is directed to the part of the skull of the healthy side (a palm width above the external auditory canal), at the same time it passes through the auditory opening of the examined side, that is, almost axially through the articular head. On radiographs obtained using this technique, you can find:

1. The contours of the joint elements.
2. The relationship of the elements of the joint.
3. Gross pathological changes.

However, this conclusion is unsuitable for studying the TMJ function. In addition, various distortions are possible, especially the width of the joint space. The picture also shows minor changes in the joint.

Tomography - a layer-by-layer image of an object under study on an X-ray film

- an additional method that allows you to obtain an image of a separate layer.

Tomography is used mainly to clarify the pathology of the upper jaw and to study the TMJ. A tomogram makes it possible to obtain indicators of the shape of the articular cavity, its width, depth, the severity of the articular tubercle, the shape of the articular head, the size of the articular space. In physiological occlusion, the articular heads are located in the middle of the articular cavity. In case of anomalies, there are three main positions of the articular heads: they can be located in the middle of the articular fossa, displaced back and up or forward and down.

A layer-by-layer study with a small angle of inclination (8-10 °), or zonography, is a combination of an X-ray image and a tomogram. In this case, the image of the object under study is clearer and more contrasting.
Research on bone age first appeared in pediatrics. One of the first orthodontists who drew attention to the relationship between the onset of mineralization of the sesamoid bone, located in the area of the interphalangeal articulation of 1 toe with a period of intensive skeletal growth, was **TW Todd** (1937).

The bone age is determined by the radiograph of the hand.
Stage 1 - pineal gland and diaphysis of the proximal phalanx of the 2nd toe of the same size. The chronological age of girls and boys is 9 years.
Stage 2 I - the epiphysis and diaphysis of the medial phalanx of the 3rd finger are of the same size. The apogee of growth will come in 2 years, but the growth of the upper jaw ends, and the lower one continues. Chronological age of girls - 9 years 7 months, boys - 11 years 2 months.

Stage 3 - the pisiform bone is mineralized, the mineralization of the hookshaped bone begins. Chronological age of girls - 10 years 5 months, boys - 11 years 9 months.
Stage 4 - the sesamoid bone appears, the mineralization of the hook-shaped bone ends. The chronological age of the girls is 11 years 3 months. boys - 12 years 5 months According Kominek, for the treatment of sagittal malocclusions is an

urgent need to move the lower jaw, as it is possible to miss a window of opportunity, especially in Class II of Angle th

Stage 5 I - the peak of pubertal growth begins, coincides with the beginning of the menstrual cycle in girls. In the medial phalanx of the 3rd finger, the pineal gland is wider than the diaphysis. Chronological age of girls - 12 years 4 months, boys - 14 years

Stage 6 - there is a decline in pubertal growth. The distal phalanx of the 3rd toe is formed: the lumen strip between the pineal gland and the diaphysis disappears. Chronological age of girls - 13 years 1 month, boys - 15 years 4 months.

Stage 7 I observe the connection of the pineal gland and the diaphysis of the proximal phalanx of the 3rd finger. The peak of growth has already passed. The chronological age of girls is 14 years 1 month, boys - 16 years.

Stage 8 - there is a connection between the pineal gland and the diaphysis of the medial phalanx of the 3rd finger. Chronological age of girls 14 years 3 months, boys -

16 years. At this stage, the child is still growing, but growth is slowing down, and this must be taken into account. Kaminek recommends only tilting or moving the teeth, moving the lower jaw is no longer possible **.**

Stage 9 - the connection of the pineal gland and the diaphysis of the radius. This stage indicates the end of the formation of the child's skeleton. Chronological age of girls - 16 years 5 months, boys - 17 years 3 months. At this stage, Kaminek recommends planning complex maxillofacial surgeries to be performed after the end of the skeleton.

5. **Topics of reports/abstracts:**

1.Photometry - what is this method and for what purpose it is used.

2. What parameters are determined from the photograph to characterize the size of the patient's head and face.

3. How to determine the morphological facies index of Izard and what information it provides.

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.
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Information resources

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2. Laura Mitchell,«An introduction to orthodontics», 2013 – 336 p.
3. Національна наукова медична бібліотека України http://library.gov.ua/

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

Practical Lesson №5

Topic: Teleradiography. Techniques of teleradiography, interpretation of teleradiography

Goal: the student must master the techniques of photometry of the head, be able to take photographs profile and face, know the basic anthropometric points and measurement parameters, be able to analyze the face and profile of an orthodontic patient, be able to study the proportions of the face.

Basic concepts: Know the anatomical formations on the face, point-like landmarks, be able to examine the patient's face, know how the face and profile are determined.

Equipment: cephalometric analys, plaster models, typodonts, panoramic x-rays.

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:**

How to determine the width, depth, length of the face.

What indexes are used to characterize the shape of the head

How is the PT point determined according to the analysis of the teleroentgenogram for, Rickets?

What are the parts of Downs teleroentgenogram analysis?

What line is the reference line of the face in the analysis of the Downs teleradiograph?

What lines form the corner of the SeNB **?**

What angle determines the position of the upper jaw relative to the plane of the base of the skull **?**

What measurements are taken during craniometric examinations?

How is the nasion point determined when analyzing teleroentgenograms?

4.Discussion of theoretical issues:

Teleroentgenogram - X-ray of the skull, taken from a distance, reflects the craniofacial skeleton and the contours of the soft tissues of the face. With the help of a teleroentgenogram, it is possible to determine the features of the growth and development of the facial skeleton, the localization of its altered growth; have a complete understanding of the structure and relationship of the bone base with the soft tissues of the face; choose the most rational method of treatment.

De Coster , Korkhause , Tweed , Bjork , Downs , Sassouni , Maj , Bimle r , Ricketts , Schwarz , A.A. have studied the anatomical variants of the structure of the facial skeleton **. El-Nofeli, Frankel , A.P. Kolotkov, Steinhauser , Legan , Burstone , Harvold , Steiner** et al .

- At present, there are more than 200 methods for the analysis of lateral telerentgenograms of the head and many additions to them. Different methods differ from each other in the types of measurements, points for linear and angular measurements, reference planes, which change little during the growth and development of the facial skeleton.
- The methods for analyzing lateral teleroentgenograms by type of measurement are as follows:
- determination of linear dimensions between certain points and their relationship (methods of **De Coster, Korkhause, Moorrees, Wylie**);
- measurement of angles (methods **Bjork, Downs, Graber**);
- determination of the proportionality of the size of the bones of the facial skeleton (methods **Maj, Luzy**);
- combined - determination of linear and angular dimensions and proportionality of the structure of the facial skeleton (methods of **Sassouni,**

Schwarz, A.A. El-Nofeli, Frankel, A.P. Kolotkova , etc.).

The most common method for decoding lateral telerentgenograms of the head in Ukraine is the technique proposed by Schwartz and other authors (**Downs, Jrobak, Ricketts**).

When analyzing the TRG **A.M. Schwarz** divides angular and linear measurements into: craniometric, gnatometric, profilometric.

The purpose of craniometric studies is to determine the position of the jaws in relation to the plane of the anterior part of the base of the skull - to determine the type of face and to identify deviations from the average size characteristic of a normal bite with the same type. The goal is to get a profile that nature has endowed the patient with no pathology. The difference between the “correct” and the actual profile is due to pathology. The purpose of gnatometric studies is to determine the morphological features of various types of malocclusion anomalies and deformities. In this case, the measurements relate to the dentoalveolar complex located between the SpP - the spinal plane, or the plane of the base of the upper jaw and MP - the mandibular plane, or the plane of the base of the lower jaw. On the basis of gnatometry, an anomaly is determined that has arisen due to the invisibility of the size of the jaws, anomalies in the position of the teeth, anomalies in the shape of the alveolar process; the size and position of the jaws, as well as anomalies in the position of the teeth, influence the shape of the face profile; the degree of inclination of the OCP - the occlusal plane to N - Se is determined, which is important for the prognosis of treatment from an aesthetic point of view.

The purpose of profilometric studies is to study the shape of the profile of the face and clarify the effect of craniometric relationships on the shape of the profile. A.M. Schwarz recommends evaluating the shape of the jaw profile by the position of the lips, in relation to the oral tangent T to Pn and Po, by the proportionality of the parts of the face and beyond the profile angle T. The main points used for the study of lateral teleradiograms:

A (ss) - subspinale - subspinal point Downs, most posteriorly located on the anterior contour of the apical base of the upper jaw;

B (sm) - submentale - submental point Downs, most posteriorly located on the anterior contour of the apical base of the lower jaw;

Ba - basion - the lowest point of the anterior margin of the foramen magnum in the mid-sagittal plane;

Ar - articulare - the intersection of the anterior surface of the basilar part of the occipital bone with the posterior surface of the neck;

C - condylen - point at the apex of the contour of the articular heads;

N - nasion - the connection of the frontal and nasal bones in the mid-sagittal plane, the position of the point may be different depending on the degree of development of the frontal sinus;

Se - sellia turcica - a point in the middle of the entrance to the Turkish saddle;

S - sella - point in the center of the Turkish saddle;

B (A-1) - the point formed by the perpendicular to SpP from point A;

Or - orbital - low placed point of the lower edge of the orbit; located on the eye edge of the zygomatic bone

Sna (ANS) - spina nazalis anterior - the top of the anterior nasal spine; located on the plane of the base of the upper jaw;

Snp (PNS) - spina nazalis posterior - posterior nasal spine; posterior border of the base of the upper jaw; **sp** - highest point on the lower sky contour;

Pt (FPM) - pterygomaxillare - the upper distal point of the crilopodimaxillary fissure, at the intersection of the foramen rotunda with the posterior wall of the pterygoid-maxillary fossa; forms a loop behind and above the
Snp point (PNS), its lowest point corresponds to the Snp point (PNS)

Gn - gnation - the junction of the lower edge of the lower jaw and the outer contour of the symphysis; anterior point on the lower contour of the lower jaw body;

Go - gonion - on the outer edge of the lower jaw when it intersects with the bisector of the angle formed by the tangent to the lower edge of the body and the posterior edge of the jaw branch; posterior point on the lower contour of the body of the lower jaw;

Pg - pogonion - the most forward point of the sub-side performance;

Me - menton - the lowest point on the symphysis of the lower jaw;

Ro - rorion - located on the upper contour of the external auditory canal, touches the Frankfurt horizontal;

Osp1 - anterior occlusal point - the middle of the vertical line of the incisal overlap between the cutting surfaces of the central incisors;

the middle of the vertical and sagittal clefts between the central incisors;

Osr2 - posterior occlusal point - the middle of the surface of the first upper and lower molars;

AOC is the projection of point A onto the OCP;

Vos is the projection of point B onto the OCP;

Pr - prostnion - the lowest and most anterior point of the alveolar process of the upper jaw;

is - incision superius - midpoint of the incisal edge of the most protruding central upper incisor;

aps - apex superius - the midpoint of the apex of the incisal edge of the most protruding central upper incisor; **ms** - molar superius - distal-buccal tubercle of the first molar of the upper jaw; **id** - infradentale - the highest and most anterior point on the surface of the alveolar process of the lower jaw;

ii - incision inferius - the middle point of the incisal edge of the most protruding central lower incisor; ***ari - apex inferius - the*** middle point of the apex of the most protruding central lower incisor; ***mi - molar inferius*** - distal-buccal tubercle of the first molar of the lower jaw; ***g - glabella - the*** most prominent point of the soft tissues of the frontal part; ***n - skin*** nasion (point of intersection of N - Se with the skin contour) ***sn - subnasale -*** cutaneous point, most posteriorly located at the transition point of the lower contour of the nose to the upper lip; ***pr (EN) - pronasale - the*** most protruding point of the tip of the nose, ***tr - trichion - the*** point of the anterior border of the scalp on the median sagittal plane ***;*** l - the most prominent point of the contour of the red border of the lower lip; ul - the most prominent point of the contour of the red border of the upper lip; st - stomion - midpoint between the upper and lower lip; ***pg***

(DT) **-** cutaneous pogonion - the most prominent point on the chin profile.

The main lines used to study lateral teleradiographs:

N - Se (NSL) - cranial plane (Schwarz), the plane of the anterior part of the skull base; connects nasion and sellia turcica; H (FH) - Frankfurt horizontal (Simon), vukhochnichna plane; connects orbital and condylen ***;***

SpP (NL) spinal plane, nasal line, plane of the base of the upper jaw; connects spina nazal is anterior i spina nazalis posterior;

OcP - occlusal plane; carried out so that at least three cusps of molars touch to it; separates the middle of the incisal overlap and the overlap of the hillocks of the last teeth that are in contact; during the temporary bite, it passes through the middle of the incisal overlap of the temporary central incisors and mounds of the second temporary molars, during the changeover bite - through the middle of the permanent central incisors and mounds of the first or second permanent molars, which are in occlusal contact;

MP (ML) - mandibular plane, plane of the base of the lower jaw, plane of the body of the lower jaw; connects the gnation and the above-placed point of the lower contour of the lower jaw body;

MT1 - tangent to the lower contour of the lower jaw; runs along the lower contour of the base of the lower jaw, starting from the point formed by the perpendicular on the MP with the pogonion, to the point of intersection of the tangent vertical line A; actual length \ Ist \ of the body of the lower jaw;

OK - actual length \ Ist \ of the upper jaw body; defined between points A-1 (perpendicular from point A to SpP) and Snp;

Pn - nasal vertical (Dreyfus) perpendicular lowered to N - Se at the point of cutaneous nasion;

Po - orbital vertical (Dreyfus) is drawn from the orbital point; perpendicular to N - Se, parallel to Pn.

The space between Pn and Po is called the Dreyfus jaw profile field.

N - A - front vertical (Downs) connects nasion and subspinale;

A - B - connects subspinale and submentale;

A - Pg - connects subspinale and pogonion;

A - tangent vertical, vertical of the posterior contour of the lower jaw branch;

MT2 - tangent to the posterior contour of the lower jaw branch; from the point of intersection of H and A, and the point of intersection of MP and A; actual length \ Ist \ of the branch of the lower jaw;

T - tangent to points sn - subnasale and pg (DT) - cutaneous pogonion; **oe - the** longitudinal axis of the upper central incisor, connects is and aps; ***ui*** - the longitudinal axis of the lower central incisor, connects the ui and the are

(the axes of other single-rooted teeth are carried out similarly) **oml** - the longitudinal axis of the upper first molar, drawn through the middle of the distance between the medial and distal roots and the intertubercular fissure; **uml** - the longitudinal axis of the lower first molar, is passed through the bifurcation of the roots of the teeth and the intertubercular fissure (the axes of other two- or multi-rooted teeth are carried out similarly).

The main angles and lines used for the study of lateral teleradiograms:

Face angle (angle F) - formed at the intersection of N-Se and NA. The average value of this angle is 85 ± 5 °. Its value characterizes the location of the upper jaw in relation to the base of the skull: forward displacement in comparison with the "middle face" - anteposition; displacement back in comparison with the "middle face" - retroposition (according to Schwartz).

With distal occlusion, the average angle can be either more or less than the average; analysis of other parameters allows us to determine the types of distal occlusion, caused not only by the anterior position of the upper jaw (prognathia), but also by the

underdevelopment of the body of the lower jaw, its branches, and a decrease in the angles of the lower jaw. In mesial occlusion, the average angle is less than the average, which indicates a retroposition of the base of the upper jaw.

The inclination angle, or the angle of inclination of the spinal plane (angle I) - is formed at the intersection of Pn and SpP. The average value of this angle is 85 ± 5 °.

If the angle is greater than the average, then the jaws are tilted forward more than in the “middle face” —anteinclination; if the angle is less than the average, then the jaws are tilted more backward - retroinclination. With anterior or posterior inclination, the direction of the occlusal and mandibular planes, the direction of the incisor axes changes.

Various combinations of the magnitude of the facial and inclination angles characterize the type of face, due to the genetic conditions of development. Depending on the size of the facial and inclination angles and the combination of their values, 9 types of faces with Schwartz are distinguished. The profile is determined by three angles: F, I, T.

Angle SeNB - formed at the intersection of N-Se and NB. The average value of this angle is 83 ± 5 °. Its value characterizes the location of the apical base of the lower jaw in the sagittal direction in relation to the plane of the skull base.

The distal bite is more often due to the retroposition of the apical base of the lower jaw, and the angle is less than normal. The mesial bite is more often due to the antelopes of the apical base of the lower jaw, and the angle is more than normal.

Angle ANB - formed at the intersection of NA and NB. Determined by the relationship of the apical bases of the jaws. The average value of this angle is 3 °. With sagittal malocclusion, the angle is different from the norm. With distal occlusion, the boundaries of

changes in the value of the angle from + 1 ° to + 11 °, with mesial - from + 5 ° to -11 °, which emphasizes the discrepancy in the location of the apical bases of the jaws.

The angle of the Frankfurt horizontal (angle H) is formed at the intersection H and P n. The average value of this angle is 90 °. Its value characterizes the location of the articular heads of the lower jaw in relation to the base of the skull, and affects the shape of the face profile. Characterizes the vertical arrangement of the temporomandibular joints. According to Schwartz, there is a relationship between the depth of the middle cranial fossa and the location of the temporomandibular joints. The flat this fossa, the higher the joints are, and vice versa.

If the angle is less than the average, then the articular heads are in the supraposition position, that is, closer to the base of the skull than in

"Middle person"; if the angle is greater than the average, then the articular heads are in the infraposition position, that is, lower than the base of the skull than

in the “middle face”. Every 2 mm of depth or height corresponds to a 3 ° angle and vice versa. With the supraposition of the articular heads or the normal position of the lower jaw, the chin is displaced backward, with infraposition - forward. In this regard, the supraposition of the articular heads affects the shape of the jaw profile as retroinclination, and infraposition as anteinclination. The location of the chin can be aligned with the growth of the branches of the lower jaw in length,

lengthening of the base of the lower jaw, an increase in the mandibular angles.

Determination of the profile type of the facial skeleton according to Khazund

Hazund modified the analysis of the position of the jaws in the sagittal and vertical directions depending on the magnitude of the basal angle and compiled a metric table of the profile type of the lower part of the face: retrognathic, orthognathic, prognathic. For this purpose, the following parameters are studied:
angles F (SeNA), SeNB, SeNPg, N-Se-SpP, N-Se-MP.

The bolts box is divided into 3 parts. If all the values lie in the same plane, namely, close to one vertical line, this indicates a harmonious structure of the face, which, as a rule, does not require orthodontic correction of the jaw bodies, but only indicates the implementation of dentoalveolar compensation (dentoalveolar form of anomalies). The deviation of the values of one or more angles of the mean values indicates a tendency to disharmony as a result of the incorrect position and inclination of the jaws in the skull, namely, in relation to the base of the skull (the gnatic form of the anomaly).

Assessment of the jaw growth type (Jrobak, Ricketts) of "growing" patients

The type of jaw growth is assessed. The degree of formation of the bone and dentoalveolar system can be detected by the X-ray of the

hand during the period of pubertal growth of the patient and by the anthropometric values of the TRG of the head in the lateral projection: by assessing the ratio of the posterior and anterior height of the facial region of the skull (Se-Go N-Me), the angle of inclination of the body plane of the lower jaw to the plane of the anterior skull (angle N-Se (NSL) -MP (ML)), the angle of the sum of three angles (angle NSeAr + angle SeArGo + angle ArGoMe), lower genius angle (angle NGoMe), facial angle according to Ricketts (angle N-Ba-Se-Gn), intermaxillary angle (formed at the intersection of SpP and MP). There are the following types of growth: neutral, vertical, horizontal.

Analysis of meaningful values obtained as a result of measurements and analysis of teleroentgenograms shows a tendency towards vertical or horizontal type of growth. This tendency is the more pronounced, the further the fields are seen from the middle (normal-facies) plot.

With the vertical type of growth, there is a favorable prognosis for the treatment of medial and deep occlusion, deep incisal disocclusion, at the same time, the prognosis for the treatment of distal occlusion and vertical incisal disocclusion is unfavorable. With the horizontal type of growth, the prognosis for the treatment of deep incisal occlusion and medial occlusion is unfavorable, but

favorable - with distal occlusion and vertical incisal disocclusion.

The angle of inclination of the occlusal plane (angle Pn OCP) is formed at the intersection of Pn and OCP. Reflects the position of incisors and molars in the vertical direction. The average value of this angle is 75-80 °.

If the angle is less than the mean, then the occlusal plane is more inclined upward in relation to the base of the skull than in the "mean face ", and this affects the aesthetic prognosis of the treatment of sagittal malocclusion. If the angle is greater than the mean, an improvement in the face profile can be expected after treatment of sagittal malocclusion.

When targeting the position of the 1st and 6th teeth (variable bite), the average value of the angle is greater than when targeting the position of the 1st and 7th teeth (permanent bite).

The angle SpP OCP is formed at the intersection of SpP and OCP. The average value of this angle is 8-10 °. Reflects the vertical placement of the anterior and posterior teeth.

The angle OCP MP is formed at the intersection of OCP and MP.

The average value of this angle is 10-12 °. The angle of the mandibular plane (angle Pn MP) is formed when crossing Pn and MP. The average value of this angle is 60-65 °.

The magnitude of the angle changes as a result of the ante and retroinclination of the jaws, infra- and supra-occlusion of the articular heads of the lower jaw, with anomalies in the position and development of the lower jaw.

The basal angle (angle B) is formed at the intersection of SpP and MP. The average value of this angle is 20 ± 5 °. Characterizes the vertical position of the jaws. Its size depends on the height of the

lateral teeth, the size of the mandibular angles, the length of the branches of the lower jaw, the height of the temporomandibular joint, the inclination of the plane of the base of the upper jaw to the plane of the base of the skull. The mandibular (genius) angle (go angle) is measured between MT1 and MT2. The average value of this angle is 123 ± 10 °. Decreasing or increasing the angle increases the severity of dentoalveolar deformities.

The Ricketts face angle (N-Ba-Se-Gn angle) is formed when the line connecting the N points to Ba and the lines connecting the Se points to Gn intersects the lower posterior angle. With a neutral type of jaw growth, this angle is 90 ± 2 °. Jaw length ratios
When decoding teleroentgenograms, the terms are used: the true (Ist) length of the jaws, that is, the one that the patient has, and the desired (Sol), that is, which should be. The desired length is calculated in comparison with the length of the anterior cranial base, i.e. the N-Se distance. According to Schmuth-Tigelkamp, the ratio of mandibular body length to anterior cranial base length should be 20:21 or 60:63.

Length of the body of the lower jaw
The length of the body of the lower jaw in its normal development is compared with the length of the base of the anterior cranial fossa. Up to 11 years old: MT1 = N - Se + 7 mm. After 11 years: MT1 = N - Se + 3 mm.

The ratio of the length of the body of the lower jaw to the length of its branches
The length of the mandible is measured from the intersection of the perpendicular drawn from the Pg point to the MT1 plane to the Go point. The height of the branches of the lower jaw is measured from the point of intersection of MT1 and

MT2 to the point of intersection of MT2 and H. Normally, the ratio MT1 /

MT2 = 7/5. The ratio of the body length of the upper jaw to the length of the body of the lower jaw

Normally, the ratio OK / MT1 = 2/3 The size of the upper jaw does NOT depend on the type of face. The value of the sagittal ratio of the apical bases and the size of the jaws behind the bit (Weet)

Assessment of the size, position and proportionality of the apical bases of the jaws is carried out by determining the relationship between the apical bases and the size of the jaws, as well as the vertical-basal ratio. The inter-view of the apical bases of the jaws is determined by the angle ANB.

The ratio of the height of the teeth in

Measuring the height of the teeth makes it possible to judge the characteristics of the growth of the jaws in the vertical plane. It is recommended to measure the height of the teeth perpendicular from the occlusal planes of the teeth to their basal planes. **The angle of inclination of the axes of the teeth in relation to the planes of the base of the jaws**

Angles are measured vestibularly. If the axial inclination of the upper incisors is 65 °, then they are in the protrusion position, more than 75 ° - in the retrusion position.

The interriceal angle (angle ii) is formed when the axes of the incisors intersect.

The average value of this angle is 140 ± 5 °.

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The ratio of the apical bases of the upper and lower jaws in the sagittal direction

Defined by angle AB-SpP. When the lines A-Pg and SpP intersect, the angle MM (maxil-Mandibular) is formed. The average of these angles is 90 °.

With the correct relationship between the dentition in a person with a middle face, points A, Pg, b are on the same line, which, intersecting with SpP, forms an angle of 90 °. These points often deviate from each other, more often the Pg point. In this case, not one, but two angles are formed: AB-SpP and A-Pg-SpP.

The human face is divided into several parts

Legan and Burstone rate two parts of the face: G - Sn / Sn - Me.

The ratio of the top of the face to the bottom is 1.

Schwartz evaluates three parts of the face: frontal - from point Tr to point N; nasal - from point N to point Sn; jaw - from point Sn to point Gn.

The shape of the profile depends on the thickness of the soft tissue. Soft tissues can both compensate for an irregular profile and further exacerbate it. Therefore, the thickness of the soft tissue must always be taken into account. This is especially important when choosing a treatment method **. Lip position** determined by their relation to line T. If line T divides the red border of the upper lip in half and touches the outer surface of the red border of the lower lip - the position of the lips is average. If the lips (one or both) are in front of the T line, the position of the lips is positive, if behind it is negative.

The position of the lips (according to Ricketts) is assessed for aesthetic bulge. Based on this, a distinction is made between concave, convex and straight facial profiles.

The face profile is determined by evaluating the position of the upper lip (UL) and lower lip (*LL*) with respect to the plane (E-plane) drawn through the points pr (EN) and pg (DT). The ul point is on the plane, and the ll point is 2 mm behind it - a straight face profile. Protrusion of the lower lip from the aesthetic plane by 1-2 mm - convex profile of the face. The lag of the lower lip from the aesthetic plane by more than 2 mm is the concave profile of the face.

P ryamaya teleroentgenography .

In addition to teleradiological examination of the skull in the lateral projection, it is also studied in direct and axial projections. Such a study is used to study the growth of the facial skull in the transverse

direction and to identify asymmetry in the presence of pathology in the transversal plane. This method is especially valuable for cross bite, lateral displacement of the lower jaw and uneven growth of the right and left half of the face.

In the orthodontic treatment of patients with a significant narrowing of the upper dentition and its apical base, curvature of the nasal septum and a decrease in the volume of the nasal cavity using the method of accelerated opening of the palatal suture according to **Derichsweiler** , the analysis of direct teleradiograms of the skull makes it possible to assess changes in the location of not only the maxillary bones, but also other bones of the facial skeleton. Direct projection is also used to determine the indications for reconstructive surgery in the maxillofacial region. The main goal of the study is the recognition of asymmetry, which is due to the uneven development of both halves of the facial skeleton or its individual parts.

8. Topics of reports/abstracts:

1.Photometry - what is this method and for what purpose it is used.

2. What parameters are determined from the photograph to characterize the size of the patient's head and face.

3. How to determine the morphological facies index of Izard and what information it provides.

9. Summarizing the information received at the lesson.

10. List of recommended literature:

Main:

5. Lectures on the relevant topic.
6. 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.
7. Golovko N.V.-Orthodontics.-Poltava.-2015. - with. 128-132.
8. L. V. Smagliuk Basic course in orthodontics / L. V. Smagliuk, A. E. Karasyunok, A. M. Bilous. – Poltava: Blitz Style, 2019. – P.173-184.

Additional:

5. Маланчук В.О., Борисенко А.В., Фліс П.С. та ін. Основи стоматології. - Київ: «Медицина», 2009 р.
6. Ravindra Nanda, Flavio Andres Uribe - Atlas of Complex Orthodontics.- Elsevier Health Sciences, 2016, 424 p.
7. Charles J. Burstone, Kwangchul Choy. - The Biomechanical Foundation of Clinical Orthodontics. – e-book - 2020 г.
8. 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

4. Державний Експертний Центр МОЗ України http://www.dec.gov.ua/index.php/ua/
5. Laura Mitchell,«An introduction to orthodontics», 2013 – 336 p.
6. Національна наукова медична бібліотека України http://library.gov.ua/
7. Національна бібліотека України імені В.І. Вернадського http://www.nbuv.gov.ua/