ADDITIONAL METHODS OF RESEARCH OF PATIENTS IN CLINIC OF ORTHOPEDIC STOMATOLOGY

Training and methodology guideline for teachers and 2nd year students of Dentistry School of medical institutes

Tashkent – 2011

MINISTRY OF HEALTH
OF THE REPUBLIC OF UZBEKISTAN
CENTRE FOR DEVELOPMENT OF MEDICAL EDUCATION
TASHKENT MEDICAL ACADEMY

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Department: Prosthetic Dentistry and Orthodontics

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The Guideline was approved at the meeting of the Central Methodology Commission of Tashkent Medical Academy "____" _____ 2011, Minutes № _____

Pro-rector for Academic Affairs of Tashkent Medical Academy
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The Guideline was endorsed by the TMA Academic Council
"____" _____ 2011, Minutes № _____

Academic Council Secretary _____
F. I. Salomova

Theme: Additional methods of research of patients in clinic of orthopedic stomatology. Hardware methods of research (thermometry, electrometry, galvanometry, LDF, rheography, photoplethysmography, polarography, radiography). Methods of definition of a pliability of a mucous membrane of an oral cavity. Methods of definition of chewing pressure. gnathodynamometry. Methods of definition of chewing efficiency. Graphic methods of registration of movements of the bottom jaw and a functional condition of muscles (masticatiography, electromyography, myotonometry, myography). Methods of diagnostics of temporomandibular joint.

1. THE EMPLOYMENT VENUE, THE EQUIPMENT.

- Chair and polyclinic of orthopedic stomatology and orthodontics dental laboratory.
- Stomatologic installations (an armchair, a drill), patients, medical stomatologic accessories, case records, phantom models, phantom tooth artificial limbs, drawings, test questions, the computer and presentations.

2. DURATION OF EMPLOYMENT – 4 (2+2) HOURS

3. THE EMPLOYMENT PURPOSES.

- To teach students to additional methods of inspection in orthopedic stomatology.
- To acquaint students with hardware methods of research.
- To acquaint with informative value of static, functional and graphic methods of research.
- To issue representation of the student about influence of functional loading on parodentium and its endurance to chewing pressure.
- To teach students to appoint additional methods of research of expediently given pathology.

The student should know:
- Hardware methods of research.
- Static, functional and graphic methods of research.
- Drawing up parodontogram.
- Kinds of rheological methods of research.
- Kinds of radiological methods of research.
- Carrying out techniques gnathodynamometry and masticatiography.

- Methods of diagnostics of temporomandibular diseases.

THE THEME SUBSTANTIATION.

In the professional work the orthopedist-stomatologist studies, distinguishes and corrects or reduces displays of certain nosological forms.

The combination of the subjective data and the results of objective methods of research supplementing each other, allows to reveal more full an etiology, pathogenesis and clinic given diseases, correctly to diagnose and accordingly plan a complex of medical actions, i.e. pathogenetic therapy.

Methods of inspection of the patient can be divided on clinical (used at an armchair of the patient) and paraclinical (that is clinics spent in auxiliary services). The last concern:

- Tool (percussion, electrometry, thermometry, craniometry, rhinopneumometry, etc.),
- Laboratory (functional chewing test, masticatiography, etc.),
- Radiological (a tomography, orthopantomography, teleradiography, etc.).

5. INTERRELATION WITH OTHER SCIENCES

Training of the given theme is based on the knowledge received on following sciences: normal anatomy, pathological anatomy, histology, normal physiology, therapeutic and surgical stomatology. The knowledge received on the given theme on orthopedic stomatology, will be necessary at studying of such clinical subjects, as therapeutic, surgical stomatology and orthodontics.

6. THE EMPLOYMENT THEME
HARDWARE METHODS OF INSPECTION.

Stomatoscopy — research of teeth and a mucous membrane of an oral cavity by means of devices (stomatoscope, photodiagnoscope, visiograph), allowing at the big increase to examine mucous and to reveal its slightest changes. This method most often apply to diagnostics of initial stages of defeat mucous, detection of first signs of malignization it is rather good-quality proceeding diseases.

Luminescent stomatoscopy it is based on use of effect of a luminescence of firm fabrics of the teeth, arising under the influence of an ultra-violet irradiation. Research spend in the blacked out room, directing on the dried up surface of tooth a bunch of ultra-violet beams. The intact enamel is shone by bluish light, and at

initial caries in the field of a stain clearing of a luminescence against a normal luminescence of the intact enamel is marked.

Electroodontometry (EOD) — it is applied to research of a condition of a pulp and a periodontium by definition of electroexcitability of nerves of a pulp. The active electrode of the special device-tester influences an electric current a pulp. The current strength thus smoothly increases before occurrence of the first unpleasant sensations or a pain.

The threshold of excitation of a healthy pulp makes 2—6 mkA (on L.R.Rubin), the inflamed pulp — 20—40 мкА. At necrosis of the crown pulps the threshold raises to 60 мкА, at disintegration of a root pulp it becomes still above — 60—90 мкА. At a top periodontitis the threshold reaches sizes 100—120 мкА. The method is used at the raised erasability, wedge-shaped defects, after preparation of teeth.

Galvanometry. Application of various metals and alloys for sealing of teeth and prosthetics creates conditions for occurrence of a galvanic cell and can lead to occurrence of microcurrents in an oral cavity. The saliva serves as electrolit, and metal parts — electrodes. Owing to a potential difference of metals on their surface ions separate and galvanic currents by force from 0,5 to 75 mV are formed.

Galvanic currents can arise not only in the presence of artificial limbs from diverse alloys (gold — stainless steel, gold — amalgam seals, etc.), but even when artificial limbs are made only of stainless steel owing to complexity of its alloy and an unequal dosage of its compound components in various serial releases. Therefore between artificial limbs in an oral cavity there is a potential difference and there are galvanic currents. The current strength is influenced by various factors: artificial limb size, presence of solderings between its parts, structure and stainless steel structure, mechanical and thermal processing of an artificial limb, quality of its polishing and the location in an oral cavity.

Unpleasant sensations concern the phenomenon of the galvanism in an oral cavity — a burning sensation, metal smack, change of flavoring sensations, dimness of

color of a gold artificial limb, etc., and also гингивиты and stomatitises. Special devices are applied to an establishment of a galvanic current in an oral cavity — galvanometers. The data of the galvanometry can be used at the decision of a question on preservation or removal (replacement) of metal artificial limbs or seals.

Hardware method of definition of degree of pathological mobility of teeth spend by means of device " Periotest".

Device "Periotest" consists from the portable analizering block with an independent food and a tip, connected by a flexible cable.

When the user gives to the device a command on the measurement beginning, the operating processor sends electric impulses to a tip with periodicity 4 blows in a second. In total in each measurement the device sends 16 impulses.

Having received an electric impulse, боек strikes blow to a tooth surface. Force of interaction бойка and tooth will be transformed by a piezocrystal to an analog electric signal which is digitized in the block of the analog-digital converter and transferred in the processor.
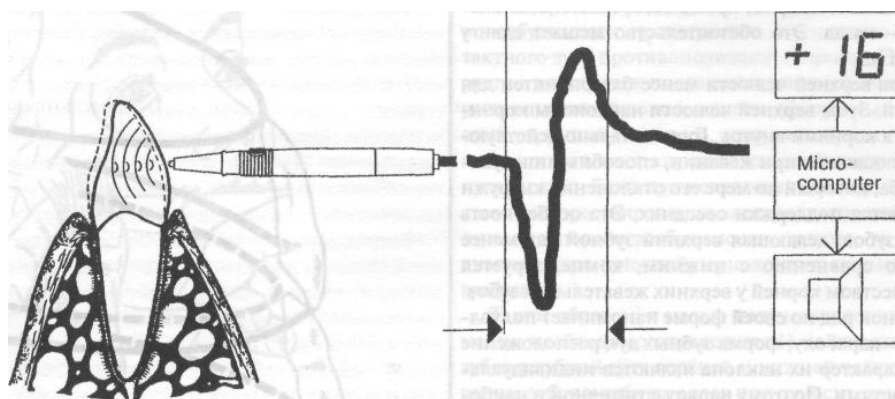
The scheme of work of device " Periotest"

Upon termination of a cycle from 16 blows the processor causes the data from an operative memory (RAM) and, having averaged their values, spends logic comparison with a matrix (received experimentally), being in ROM.

Having defined, the result concerns what group, the device sends signals to sound and display blocks for a conclusion of results in vocal and digital forms. Prior to the beginning of following measurement the result remains in the RAM and is displayed on the indicator in the form of a digital index.

Values of an index are in limits from-08 to +50.

On degrees of mobility value of indexes are distributed as follows:

• 0 degree:-08 to +09;

• I degree: from +10 to +19;
• II degree: from +20 to +29;
• III degree: from +30 to +50.
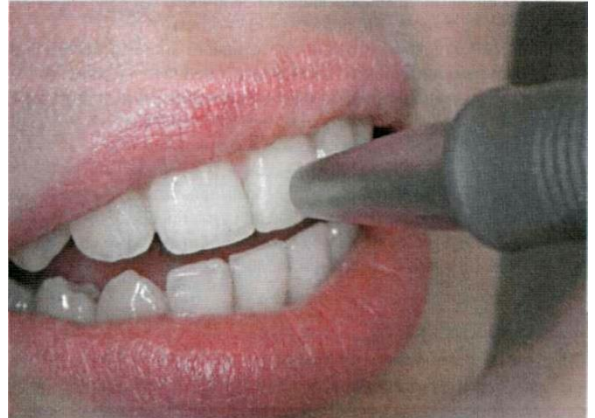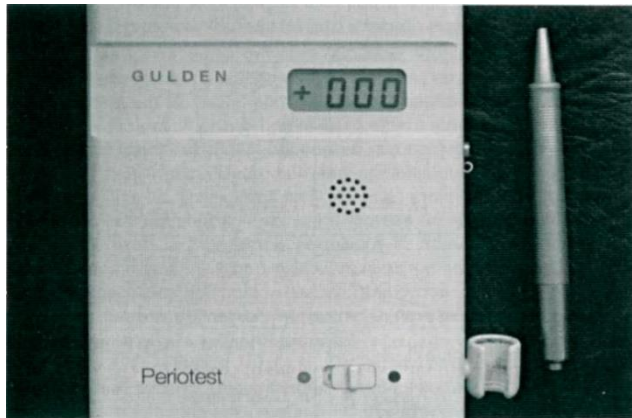
Percussing of the investigated teeth covered with crowns, spend at level of the middle of a vestibular surface. Thus the tip settles down horizontally and at right angle to the middle of a vestibular plane of a crown of investigated tooth on distance 0,5 - 2,5 mm.

The head of the patient is positioned in such a manner that the vertical axis of investigated tooth is perpendicularly in relation to a tip. During carrying out of research tooth alignments should be opened.

The amortization received thus (mobility equivalent) forms a basis for an estimation of degree of mobility of teeth. Certain skill of recalculation of the received values (taking into account the sizes of roots, a condition of a periodontal crack and a tooth alveolus) is thus necessary.

Good results of "Periotest" shows at mobility definition of implants that allows to judge on amortization osteointegration. It is considered that in comparison with a manual technique, the electronic method allows to receive more objective results.

Laser Doppler Floumetry. For realization of a method Laser Doppler Floumetry the laser analyzer of speed of a superficial capillary blood-groove «ЛАКК-01» is used. Delivery of laser radiation to an investigated surface and the reflected radiation to the device is carried out quartz by a lightguiding three-channel probe, diameter 3 mm and in the length 1,8 m. One of optical paths as a part of a probe transfers laser radiation in length of a wave 0,63 microns to investigated surfaces, and other two optical paths carry out reception and transfer of the reflected photosignal to the photodetector. The device provides definition of indicators of a capillary blood-groove in a range from 0,03 mm/with to 6 mm/with. The method essence consists in the following. Monochromatic radiation laser helium-neon is delivered to an investigated site on lightguiding probe. Being reflected from erythrocytes, it undergoes change of frequency of a signal –

Doppler's effect, directly proportional to speed of movement of erythrocytes. The reflected radiation arrives on световодному to a probe in the device for the further processing.

The LDF-SIGNAL is registered from fabric volume nearby 1 мм3 where contains an order of 200 microvessels in which simultaneously is about ten thousand эритроцитов. Therefore the LDF-SIGNAL reflects the cumulative processes in one stage proceeding in microvessels, being in a measurement zone.

The device has the interface block, allowing to connect the device to the computer of type IBM of any configuration. For device and computer communication the cable with a standard socket which is connected to the subsequent port of the computer is applied. It allows to conduct monitoring of haemodynamics in the course of inspection of the patient.
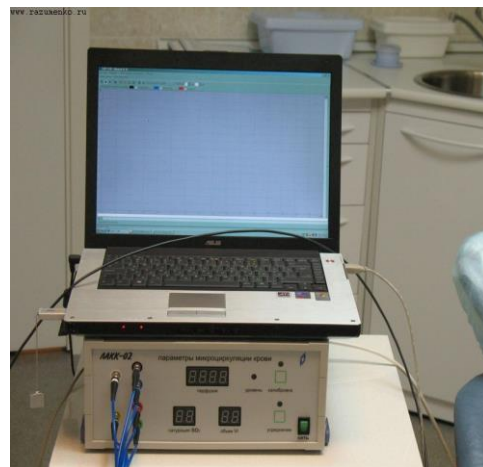
Device "ЛАКК-01" connected to the computer.

Ultrasonic Dopplerography. Microcirculation of fabrics of the chewing device and a condition of a vascular channel are studied also by means of methods contact capillaroscopy or ultrasonic Dopplerography. Last is based on research of a blood-groove by registration of fluctuations of ultrasound at passing it both through parodentium fabrics, and through firm fabrics of tooth. In last variant the blood-groove is investigated. Besides, by means of the given method probably measurement both linear, and volume speed of a blood-groove of a pulp of tooth. And, it is spent noninvasively and without serious consequences.

Rheography — an objective and painless method of research sphygmic fluctuations of vessels filling of various bodies and the fabrics, based on graphic registration of changes of full electric resistance of fabrics. In stomatology methods of research of blood circulation in tooth — *rheodentography*, in fabrics parodentium — *rheoparodentiography*, periarticular areas — *rheoarthrography* are developed. Rheography apply to early and differential diagnostics, an estimation of efficiency of treatment of various diseases. Researches spend with

the help реографов — the devices, allowing to register changes of electric resistance of fabrics and special gages. Record реограммы spend on writing devices.

For rheoparodentiography apply silver electrodes the area 3x5 the mm one of which impose from the vestibular party (current), and the second (potential) — with palatal or lingual the parties along a root of investigated tooth. Such arrangement of electrodes name cross-section. Electrodes fix on a mucous membrane by means of medical glue or a sticky tape. Earthing electrodes fasten on an ear lobe. Electrodes incorporate to the measuring bridge rheographe. Having connected gages to devices and having spent calibration, start record. Simultaneously for convenience of calculation write down the electrocardiogram in II assignment and differential rheograme with constant time 10 with.

To carrying out rheodentography apply the electrodes which metal plates have the sizes and the curvature, corresponding vestibulooral to tooth surfaces (Prohonchukov A. A, Loginov H. K, hares of Century П, 1969).

Photoplethysmography differs from rheography that registers change of fabrics filling not in the electrometric way (on change of electric resistance), and on change of optical density of fabrics.

Photoplethysmography spend by means of special electron-optical devices – photoplethysmographs. At the heart of a method the density sensitometry principle, i.e. definitions of optical density of an investigated material on reflection, penetration and light absorption by various environments (in this case organism fabrics) lies. Through is-followed fabrics pass a stream of monochromatic light which bring by means of special optical paths and optical filters. After passage or reflection the light stream arrives on a photodetector (gage) which will transform light energy in electric, arriving on the amplifier and the registrar. Intensity of light reflected or disseminated by the investigated fabric, depends on quantity of blood containing in it.

Polarography (PG) – an electro-chemical method of definition of pressure of oxygen (oxyimetry) in fabrics.

The method is graphic registration of dependence of a current strength from pressure at its passage through solutions or biological fabrics. The method name is connected with processes of polarization which occur thus on the cathode.

Method basic purpose – diagnostics of a fabric hypoxemia and definition of its degree in пародонте, a face skin, transplants. By means of this method objectively estimate efficiency of means of struggle against a fabric hypoxemia, such as antihipoxants, antioxidants, and various ways of oxygenation of fabrics.

1 - an automated workplace «Polar-1» for registration of oxidation-reduction potentials a polarographic method (PG). 2 - Imposing contact polarographic the gage on a mucous membrane of the attached gum.

Echoosteometry — a method of research of density of a bone fabric. The method is based on change of sound transmission of the bone fabric depending on its density. Thus register time (micro seconds) of passage of an ultrasonic impulse on a bone of the bottom jaw as its body has sufficient length for placing of gages. Because bones of the top jaw it is dense сращены with bones of a skull, researches on it don't spend. For comparison of repeated individual results of measurements under the formula count speed of distribution of ultrasound in a bone fabric. This speed will be that more than less porosity and is more dense bone structure. With development of an osteoporosis indicators ehoosteo-metrii decrease.

LABORATORY METHODS OF INSPECTION.

Gnathodynamometry – a method of definition of chewing pressure. The knowledge of endurance пародонта certain teeth to chewing pressure allows to be guided in its admissible functional loading at prosthetics.

♦ Chewing pressure — the force developed by chewing muscles and regulated by receptors parodentium, necessary for crushing, a nibble, food smashing.

To measurement of force of chewing pressure apply the device named gnathodynamometre, and chewing efficiency check chewing tests.

Chewing pressure upon cutters approximately equally at women - 20—30 kg, at men — 25—40 kg, on molar accordingly — 40 60 kg and 50-80 kg.

For the first time the device of this type has been offered in 1893 by Blek. Blek's gnatodinamometre is similar on ordinary gag, cheeks which are moved apart by an elastic spring. supply with a scale with the index which at squeezing of cheeks teeth moves, specifying pressure force in certain units. This device has served as a prototype for many other similar devices. Блек the first has paid attention that the

average digital expression of pressure received by it for моляров 77,7 kg aren't an indicator of all muscular force, and there is a limit of that can take out a tooth periodontium. The sensation of a pain stops the further reduction of muscles. Schröder carry out experiences with sensitivity deenergizing parodentium by the use of anesthesias. So, at the man 21 years normal pressure equaled 35 kg, and after anesthesia has risen to 60 kg. At reduction continuation there was a pain and danger of destruction of crowns of teeth.

Have been offered gnatodinamometres more difficult device, receiving which part has electronic gages (I.S.Rubinov, L.M.Perzashkevich, D.P.Konjushko).
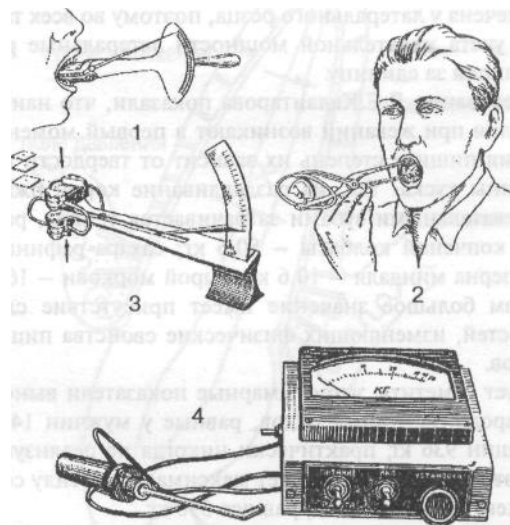
1. Gnatodinamometr Blek; 2. Gnatodinamometr Tissenbauma; 3. Gnatodinamometr Gaber; 4. Electronic Gnatodinamometr I.S.Rubinov and L.M.Perzashkevich.

Last years new designs — electronic gnatodi-namometry "Viewfinder" are offered. They are devices with an independent food from the storage battery with rated voltage 9,6 Century This nastol th device consists from tensometric the gage and functional knots, has digital indexation of results of measurements of force in newtons. Gnatodinamometr it is supplied by the replaceable nozzles made of stainless steel for various departments of a tooth alignment. The basic part of the gage is the elastic element in the form of a double beam of equal resistance. On the free ends of a beam are located occlusal platforms which are located between the teeth-antagonists perceiving force chewing of muscles. Measured force causes deformation of an elastic element which leads to change of electric resistance tensoregisters .

After work check gnatodinamometr (control of the zero indication of a digital board) occlusal gage platforms establish between antagonist teeth and the examinee as much as possible compresses them. The result is fixed on a digital board.

Methods of definition of chewing efficiency

Under masticatory efficiency it is necessary to understand degree izmel-chenija certain volume of food in a definite time.

Methods of definition of chewing efficiency can be divide on static, dynamic (functional) and graphic.

Static methods are used at direct survey of an oral cavity surveyed, thus appreciate a condition of each tooth and all available teeth and enter the obtained data in the special table in which the share of participation of each tooth as chewing is expressed by appropriate factor. Such tables were proposed by many authors, but in our country use N.I.Agapov and I.M.Oksman's methods is more often.

In N.I.Agapov's table for unit functional efficiency the lateral cutter of the top jaw is accepted.

The table of factors on N.I.Agapov

Teeth of upper jaw	1	2	3	4	5	6	7	Summa (in units)
Coefficiens (in units)	2	1	3	4	4	6	5	50
Altogether								100

The table of factors on I.M.Oksman

Зубы		1	2	3	4	5	6	7	8	Summa (in units)
Coefficiens (in units)	upper jaw	2	1	2	3	3	6	5	3	50
	lower jaw	1	1	2	3	3	6	5	4	50
Altogether										100

In the sum functional value of tooth alignments makes up 100 units. Loss of one tooth on one jaw is equal to (at the expense of infringement of function of its antagonist) to loss of two teeth with the same name. In N.I.Agapov's table a wisdom teeth and functional status remained teeth isn't considered.

I. M.Oksman has offered the table for definition to masticatory ability of teeth, in which factors are founded on the account of the anatomo-physiological data: the areas occlusal surfaces of teeth, quantity of hillocks, quantity of roots and their sizes, degree of an atrophy of an alveolus and tolerance of teeth to vertical pressure, conditions paradentium and reserve forces nefunktsio-nirujushchih teeth. In this table lateral cutters also are accepted for unit of chewing efficiency, a wisdom teeth of the top jaw (with 3 tubercules) is estimated in 3 units, the bottom third molars (with 4 tubercules) — in 4 units. In the sum it is given 100 units. Loss of one tooth involves loss of function of its antagonist. In the absence of third molars sle-blows to accept for 100 units of 28 teeth.

For approach of a static method to V.K.Kurljandsky's clinical diagnostics has offered even more detailing the scheme of an estimation of chewing efficiency which has received the name odontoparodontograms.

Odontoparodontogram represents the scheme-drawing in which bring the data about each tooth and its basic apparatus. The data is presented in the form of conditional o designations, received as a result of clinical inspections, radiological researches and gnathodynamometry. Following designations concern them: N — without pathologic changes; 0 — tooth is absent; 1/4 — an atrophy of the first degree; 1/2 — an atrophy of the second degree; 3/4 — atrophy the third degree. An atrophy more than 3/4 carry to fourth degrees at which tooth is kept soft tissues and is subject to removal.

Endurance of basic fabrics parodentium designate in the conditional factors made on the grounds of proportional parities of endurance of teeth to pressure at people, not having illnesses paradentium. The last one is defined by gnatodinamometry separate groups of teeth.

Depending on atrophy and degree of mobility of teeth the factor endurance basic fabrics to the loadings arising during processing of food decreases accordingly.

Each tooth has the reserve forces which have been not spent at crushing of food. These forces are approximately equal to half possible loading which can take out parodentium.

In norm factor of endurance of the sixth tooth is composeed from 3, and its reserve force is equal 1,5 units At increase to atrophy degree reserve force decreases. So, at an atrophy alveolar socket reserve forces sixth tooth are equal to

the first degree 0,75 units, at the second degree — 0, and at third degrees there comes functional insufficiency.

The scheme-drawing of future odontoparodontogram consists of three numbers of the cages located in parallel the friend over the friend.

In the middle of the drawing a number of cages with designation of the tooth formula, and over and under this number arrange cages in which the data about a dental health and a bone fabric paradentium (norm, atrophy degree, absence teeth is brought) settles down. Then there is a number of cages in which expose the data of residual force of the basic fabrics expressed in conditional factors.

After scheme-drawing filling conditional designation make addition of factors top and lower jaws, and the received scheme is taken out on the right half odontoparadontogram. On the basis summary the data define power parities between dental numbers of jaws.

Functional chewing tests. Christiansen in 1923 for the first time developed
their technique. Surveyed give for chewing three identical cylinders from a coconut. After 50 chewing movements the surveyed spits out the chewed nuts in a tray; them wash out, dry up at temperature 100° during 1 h. Also sift through 3 sieves with apertures of the different sizes. By quantity remained in a sieve unsift particles judge efficiency of chewing.

Later on the technique of chewing test of Hristiansena has been modified in our country S.E. Gelman in 1932

Gelman's chewing test. S.E.Gelman has offered define efficiency of chewing not by quantity of chewing movements as Christiansen, and during time 50 seconds. For reception of chewing test are required quiet conditions. It is necessary to prepare packaged almonds, a cup (tray), a glass with boiled water, a glass funnel in diameter 15x15 sm, gauze napkins in the size 20x20 sm, a water bath or a pan, a metal sieve with apertures in size of 2,4 mm, scales with set of weights.

To the surveyed give for chewing 5 г kernels of almonds and after instructions "begin" count 50 with. Then investigated spits out the chewed almonds in the prepared cup, rinses a mouth boiled water (in the presence of a demountable artificial limb rinses also it) and also spits out it in a cup. In the same cup add 8-10 drops of 5 % solutioncorrosive sublimate then filter cup contents through gauze napkins over a funnel. The almonds which have remained on a gauze put on a water bath for drying; thus watch not to overdry test as it can lose weight. Test is considered dried up when its particles at petrissage don't stick together, and are separated. Almonds particles carefully remove from a gauze napkin and sift through a sieve. At intact tooth alignments all chewing weight is sifted through a sieve that testify to 100 % of efficiency of chewing. At presence of residue in a

sieve it weigh and by means of a proportion identify the percent of infringement of efficiency of chewing, i.e. relation of the rest to all weight of chewing test.

For example if in a sieve remains 1,2 g the loss percent of the chewing efficiency will be equal:

5: 100 1,2:x;

x = (100 1,2:5 = 24 %.

Physiological chewing test on Rubinov. In I.S.Rubinov's opinion, the tests received at chewing 5 g of almonds, are inexact, as such quantity of food substance complicates the chewing certificate. He considers more physiological to be limited for chewing test by one grain a wood nut is powerful 800 mg. The chewing period is defined on occurrence of a reflex of swallowing and is equal on the average 14 seconds. At occurrence of swallowing reflex weight spit out in a cup; its further processing is conform to Gelman's technique. In cases of difficulty of chewing of a kernel of a nut of I.S.Rubinov recommends to apply to test a cracker; time of chewing of a cracker before reflex occurrence swallowing is equal on the average 8 with.

Graphic methods of registration of movements of the lower jaw and functional condition of muscles. In 1954 I.S. Rubinov has offered the device — masticatiograph and has developed a registration technique on kymograph movements of the lower jaw during chewing, nameed it masticatiography. It is a graphic method of registration of reflex movements of the lower jaw (from Greek masticatio — chewing, grapho - I write). For using it method the devices consisting from registering of adaptations, gages and writing down parts have been designed.

For installation registering devices it is necessary to consider as the most expedient place mental area the lower jaw where soft fabrics are a little displaced during function. Besides, amplitude of movement of this part of the lower jaw in the course of chewing more than its other sites owing to what registering the device catches them is better. Record was made on kymograph or on oscillographic and tensometric installations. All complex of movements connected with chewing of a piece of food, from the beginning of its introduction in a mouth till the moment deglutition, is characterized as the chewing period. In each chewing period differs five phases. On kymogram each phase has characteristic recording.

The *first phase* — a rest condition — corresponds period before food introduction in a mouth when the lower jaw is immovable, the muscles are in the minimum tone and the bottom tooth alignment will defend from top on distance of 2-3 mm, that is corresponds to position of rest bottom jaw. On kymogram this phase is designated in the form of a straight line in the beginning of the chewing period, that is an isoline.

The *second phase* — opening of a mouth and food introduction. Graphically to it there corresponds the first ascending knee of a curve which begins at once from a rest line. Scope of it elbow depends on degree of opening of a mouth, and its steepness indicates for speed of introduction in a mouth.

The *third phase* — an initial phase of function of chewing (adaptation), begins with top of an ascending knee and conform to adaptation process to initial crushing a food piece. Depending on physicomechanical properties of food there are changes in beat and swing curve this phase.

The *fourth phase* — the basic phase of function of chewing - is graphically characterized by correct periodic alternation of chewing waves. Character and duration of these waves at normal condition chewing systems depend from consistence and sizes of a piece of food.

After the termination of the basic phase of chewing the *fifth phase* - a phase of formation of a lump of food with the subsequent deglutition it begins. Graphically this phase looks in a kind undulatory curve with some reduction of height of waves.
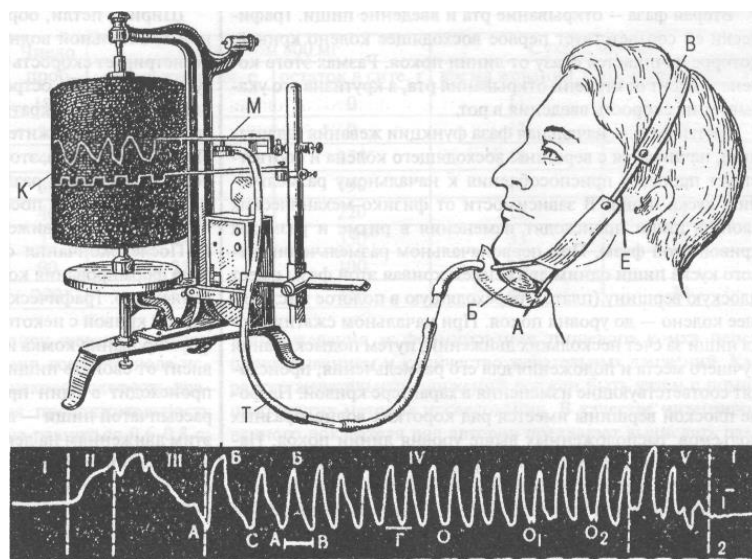
Kymogram of the one masticatory period.
I - a rest condition, II — a phase введе¬ния food in a mouth, III — an initial phase of function of chewing, IV — the basic фа¬за chewing, V — a phase of formation of a lump and it проглатывания, About — мо¬мент смыкания tooth alignments and раз¬давливания food, Oi — the moment раз¬малывания food (time in seconds).

For maintenance of identical record of chewing it is necessary to observe a number of conditions: throughout all period research identical speed gyration a drum

kimograph should remain; average duration of a separate chewing wave should equal 0,6-0,8 with; the feather mareev's capsules should be established so that scope of waves fluctuated within 3-4 see

Electromyography — a method functional researches of the muscula biopotential r system, allowing graphically to register biopotentials of muscles. Biopotentials — a potential difference between two points of the living tissue, reflecting it bioelectric activity.

Registration of biopotentials allows to define a condition and functionality of various fabrics. With that end in view use multichannel electromyograph and special gages — cutaneous electrodes.

Electromyography it is necessary to spend at hypotheses about diseases of a temporo-mandibular joint and muscular system

Electromyomasticatiography. For the purpose of specification indexes of electric oscillation of chewing muscles according to separate phases of the chewing period the method electromyography has been used in a combination with masticatiography. With the help masticatiographe movements of the lower jaw are registered, and by means of taking away electrodes — biocurrents from chewing muscles. By means of this method it is possible to reveal insufficiency biopotentials of chewing muscles on separate sites masticatiogram. This method can be used for check of efficiency of medical actions.

Masticatiodinamometry. The forces developed by the chewing muscles during compression of tooth alignments, are formed with the help gnatodinamometrs of various designs. Indicators of the gnatodinamometry judge on the patients sensation, connected with a pain or unpleasant feeling.

The method of definition of force of chewing — masticatiodinamometry (I.S. Rubinov, 1957) — is based on application of the natural food substances of certain hardness with synchronous graphic registration chewing movements of the lower jaw. Preliminary with the help fagodinamometra efforts (in kgs), is needed for crushing of this or that substance are defined. The name of the method —

masticatiodinamometry — specifies in measurement of force of chewing unlike gnatodinamometry — measurements of force of compression of jaws. On character of recordings chewing of food substances with known hardness it is possible to judge intensity of chewing.

myotonometry — a method of definition of a tone chewing and mimic muscles. Thus using palpation the most active (motor) point of a straining muscle is defined. The point projection is marked on a skin by a felt-tip pen. On parotid area of the person the transparent plate is imposed. On it obverse reference points and a motor point are marked. In need of the subsequent control measurements with its help at any time it is possible to define localization of a motor point (S. B.Fishchev).

Measurement is spent by the device myotonometer which represents a manometer with acting of it probe in diameter 5 mm. Probe leans against noted point and plunges into it on 6 mm before contact of a skin to a restrictive platform. The tone of rest and a tone of pressure of a chewing muscle is thus measured.
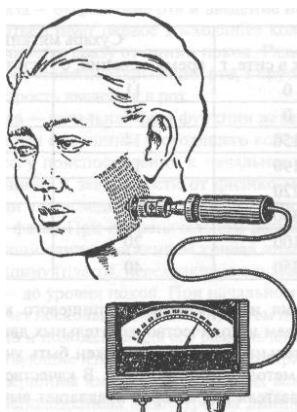
Definition of a tone actually chewing
Muscle myotonometer.

Myography. A method of myography the activity of muscles connected with change of their thickness during isotonic and izome-tricheskih of reductions is registered. In the course of chewing the thickness of muscles changes in connection with increase and fall of their tone. The method myography is applied to the account reflex reductions (a thickening and thining) of chewing muscles. Introduction of myography in clinic is perspective for registration of function of mimic muscles in norm and at a pathology.

RADIOLOGICAL METHODS OF RESEARCH

The basic technique radiological research, used in stomatologic practice, is radiography. The roentgenoscopy is applied much less often, basically for the purpose of localization definition heterogeneous bodies, sometimes at traumatic damages. But and in these cases raying it is combined with preliminary or the subsequent radiography.

Radiography allows to reveal presence of cysts, granulomas and retention teeth, foreign matters in maxillofacial area (fragments of injection needles, pulp extractor, a root needle, a pine forest, etc.). It gives the chance to specify the diagnosis of apical or regional defeat of paradentium, to diagnose functional an overload of separate teeth in connection with traumatic an articulation or a wrong design of tooth artificial limbs.

Methods of radiological research divide on fundamental (intra- and extraoral radiography) and additional (a tomography, panoramic radiography, teleradiography, electroroentgenography, the computer tomography, etc.).

Intraoral roentgenograms are gotten on the films wrapped at first in black, and from above in a waxen paper for prevention of influence of a saliva. For extraoral roentgenograms use cartridges with strengthening screens. Application of strengthening screens allows to decrease an exposition and by that beam load on the patient, however sharpness and structural properties of the image at the expense of fluorescing action of screens worse, than on intraoral roentgenograms. Intraoral roentgenograms depending on film position in on-losti a mouth subdivide on contact (a film adjoin to investigated area) and pictures in occlusion (the film is held on close teeth and is on some distance from investigated area). Most accurately structure of teeth and surrounding fabrics it turns out on intraoral contact roentgenograms.

Intraoral contact radiography. At contact intraoral pictures it is recommended to direct a tube roentgen tubes under a certain corner for teeth of the top and bottom jaws, using an isometry rule: the central beam passes through a top of a root of removed tooth perpendicularly to a bisector, the tooth formed by a long axis and a film surface. Deviation from this rule leads to shortening or lengthening object, i.e. the image of teeth turns out more long or more shortly teeth.

For shooting of separate teeth or their groups are available specified features of position of a x-ray film in an oral cavity, an inclination of a x-ray tube, a direction of the central beam and a place of contact of top of a tube with a face skin.
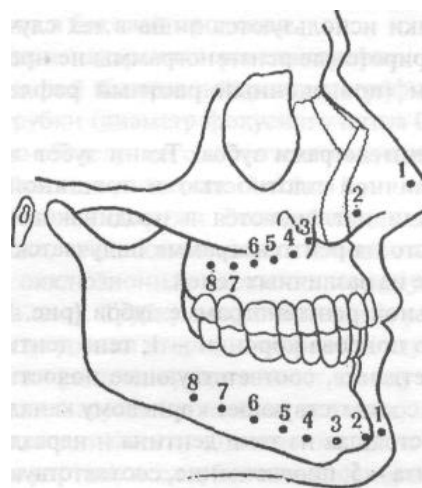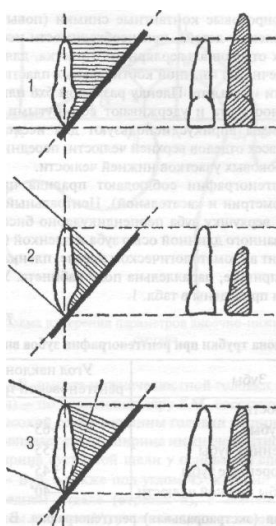
The projective image of tooth in dependence
From the central beam direction :   *Scheme of a projection of tops of roots*
1 — tooth lengthening — the central beam   *on a face skin.*
is directed the perpendicularly to a tooth
axis; 2 — tooth shortening — teeth. The central
beam is directed perpendicularly to a film;
3 — isometric — the correct image of tooth.

Intraoral radiography in occlusion. Roentgenograms *in occlusion* are carried out when it is impossible to receive intraoral contact pictures (the raised emetic reflex at children), if necessary research the big departments of an alveolar shoot, for a condition estimation buccal and lingual cortical plates of the lower jaw and a mouth bottom. 5x6 or 6x8 sm enter a film in the size into an oral cavity and keep close teeth. Thus the central beam is aimed on a tooth top to perpendicularly bisector of angle, the tooth formed by a long axis and a film. The patient sits in a stomatologic armchair, the film, oriented in a bite, is parallel to an office floor.

Extraoral radiography. In extraoral pictures the image of teeth and surrounding their formations turns out less structural. Therefore such pictures are used when to receive only intraoral roentgenograms it is not represented - possible (the raised emetic reflex, trismus, etc.).

The **tomography** - level-by-level research – is the supplementary method, permitting to receive the image of a certain layer of studied area, having avoided superposition of the shades complicating treatment of roentgenograms. Special devices are using - tomographs or tomographic prefixes. During carrying out of a tomography the patient is motionless, a x-ray tube and the cartridge with a film are moving in opposite directions.

By means of a tomography it is possible to receive the x-ray image of a certain layer of a bone on the necessary depth. This method is especially valuable to studying various pathology a visochno-maxillary joint, the lower jaw in the field of

its corners (concerning a trauma, a tumor, etc.). Tomography it is possible to receive in three projections: sagittal, face-to-face and axial. Pictures do layer-by-layer with "step" 0,5-1 sm

For research of a visochno-mandibular joint lateral tomograms in position with opened and the closed mouth are carried out. The patient lies on a stomach, the head turned and an investigated joint adjoins to a table deck. The sagittal plane of a skull should be parallel plane a table. The tomogram is spent on depth 2-2,5 see

Increased panoramic radiography. At carrying out of increased panoramic radiography acute focused tubes (diameter of a focal stain of 0,1 mm) enter the anode into an oral cavity surveyed, and in polyethylene to the cartridge in the size 12x25 sm with strengthening screens place a x-ray film outside. The patient sits in a stomatological armchair, middle sagittal plane perpendicular to a floor, occlusal the plane of an investigated jaw is parallel to a floor.

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Tube enter into an oral cavity on an average line of the person to level of the second molars (on depth of 5-6 sm). A x-ray film presses to the person itself observable, separately to the top and lower jaw, and in it position make shooting.

The given method it is possible get a full picture of all teeth in the form of a panoramic picture with the big sharpness and increase in 2 times, and in comparison with usual pictures the irradiation of the patient is less in 25 times.

Electroroentgenography. Deficiency of expensive silver — a component of a photographic emulsion - dictates necessity of searches of materials for radiography, not containing it. It is as a result developed and внедрен in practice a method **electroroentgenography** (xero(radio)graphy). At the heart of a method removal electrostatic a charge from a surface of the plate covered with selenium, with the subsequent dusting of a color powder and carry images on a paper lies.

For method carrying out it is developed special electroroentgenographic device ERGA consisting of two blocks: the block of a gymnastics and the block of display of the x-ray image.

Teleradiological research in stomatologic practice. As the term « teleradiography» understand research performance at big focal distance, providing the minimum distortion of the sizes of investigated body. The pictures received by such way use for carrying out of the difficult anthopometrical measurements, allowing to estimate mutual relation various departments of an obverse skull in norm and at pathological conditions. The technique is applied to diagnostics of various anomalies of a bite and an estimation of efficiency of spent orthodontic actions.

At research reception of identical roentgenograms is necessary to make use of craniostat, providing fixing position of the patient. Complexities of a structure of a skull demand performance of radiogram in two mutually perpendicular projections — direct and lateral.

Computer tomography. The method principle consists that after passage of X-rays through flew the patient they are registered sensitive detectors. Signals from the detector arrive in the computer which overworks received information under the certain program. The car spatial defines an arrangement of sites, differently absorbing X-rays. As a result on the screen television devices — the display — it is recreated synthetic the image of investigated area.

The received image isn't a straight line roentgenograms or the tomogram, and represents synthesized an image made by the computer on the basis of the analysis of degree of absorption by fabrics x-ray radiation in certain points. A thickness of cuts КТ is varyed from 2 to 8 mm.

Radiography with use of contrast substances. The technique syalography at research of channels major salivary glands consists in their filling iodine-containing [iodinated] contrast agent. Research is spent for diagnostics mainly inflammatory diseases of salivary glands and слюннокаменной illnesses.

Angiography — a method contrast roentgenologic researches of vascular system of arteries (артериография) and veins (венография).

RADIOVISIOGRAPHY — a radiological method of inspection with is-using of the analog form of a presentation of the received image.
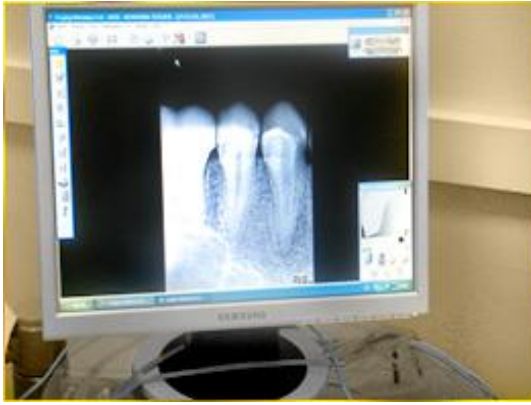
Radiovisiograph is a complex of the equipment on the basis of the personal computer, consisting of the several modules united in uniform functional system. The x-ray image is read out by an electronic sensor control (or an electronic matrix), possessing high sensitivity to X-rays. Then the image from a matrix on fiber-optical system is transferred in the computer, processed in it and displayed the monitor. During processing of the digitized image the increase in its sizes, contrast strengthening, polarity change (from a negative on a positive), color correction can be carried out. From the screen of the monitor the image can be transferred on a paper by means of the printer entering into the complete set of the equipment. It is necessary to notice that sensitivity of the gage radiovisiograph above, than at a x-ray film, but resolution considerably lags behind that at dental x-ray devices that influences quality of the image.

Radiovisiograph allows to execute following actions also:
• to unpack on a paper the x-ray image;
• to create bank of the radiological data;

• to export pictures on a local computer network to others funktsio-nalnye divisions on other data carriers;

• to receive two-dimensional images of the person, an oral cavity of the patient (at examination, before fixing and imposing of artificial limbs) by means of miniatures th of an intraoral videocamera;

• to spend careful clinical viewing of the color video image as the doctor, and the patient, (for example, all teeth of the patient on the screen monitor), manipulating thus drawing, increasing it, turning in a plos-bone, etc.

Except usual indications radiovisiography it can to be applied, for example, for defectoscopy metal skeletons of artificial limbs.

Manufacturers of radiovisiographs, guarantee decrease in level of ionizing radiation on 90% in comparison with usual x-ray techniques. However there should be no illusions that the remained 10 % are safe for patients and for the personnel. In this connection the generator of a x-ray irradiation should be reliably isolated from a medical stomatologic office.

INSPECTION OF THE TEMPORO-MANDIBULAR JOINT

Diagnostics of diseases of a temporo-mandibular joint is based on the data of the anamnesis, clinical research of an oral cavity and joints, functional tests, results of radiological researches.

During conversation with the patient it is necessary to find out its complaints. More often patients complain of a clicking in a joint, a pain, restriction of opening of a mouth, a crunch, a headache, hearing fall.

Upon termination of poll of the patient spend a palpation of a joint by imposing of fingers on a skin, in front of a trestle of an auricle or introduction of fingers to external acoustical pass.

♦ the Palpation — use of fingers (as a rule, small pillows of trailer phalanxes of the big, index, average fingers, is more rare — a little finger) for research of a tone of chewing muscles, localizations in them of painful points, research of the bone basis of an orthopedic bed, and also studying of deviation and a pliability of a mucous membrane of an oral cavity, in particular — bridles and dangling crests.

At a joint palpation the pain can come to light, pushes, a clicking and a crunch are often felt. Therefore the palpation here carries out a role of auscultation though noise, it is possible to listen to a crunch, a clicking a phonendoscope. Besides, introduction of noise in the analog form in the computer (in the presence of corresponding programs) allows to receive their spectral analysis. Such method of diagnostics is called артрофонометрией (A.Ja.Vjazmin; E.A.Bulychyov).

Check of excursion of the bottom jaw concerns functional tests of a joint at opening and mouth closing. Following two types of its movements can be thus noted. At the first, named to straight lines (forward, smooth), the trajectory

резцовой points on a face-to-face plane at opening and mouth closing isn't displaced aside. At the second — wavy (zigzag, step) intermaxillary the point at movement of the lower jaw is displaced to the right or to the left from sagittal planes, forming a wave or a zigzag, a step. When the trajectory intermaxillary points combines elements of direct and wavy movement of the bottom jaw, speak about the combined movement.

NEW PEDAGOGICAL TECHNOLOGIES, APPLIED ON EMPLOYMENT
Interactive games: «the Weak link», "Pig in a poke"

Technology of carrying out of game «Weak link».

For work it is necessary:

1. A set of questions on an employment theme

2. A sheet of paper with the list of group for conducting the report of game.

3. A stop watch

Work course:

1. Game is spent by the teacher and the assistant from among students – the counter.

2. The counter on sheet writes date, group number, faculty, the name of game and the list of students of group.

3. The teacher consistently asks questions to students from a set of questions.

4. The student should for 5 seconds answer.

5. The teacher a word "truly or"incorrectly"estimates the answer and if the answer is incorrect, itself gives the right answer.

6. The counter puts opposite to a surname of the student «+» or «-», in dependence of correctness of the answer.

7. Students pass thus 2 rounds of questions.

8. After 2 rounds of questions game stops also students who have received 2 minuses, leave game as «a weak link».

9. Game proceeds on a new circle with remained students. One new round of questions again is offered and again students at whom in the sum with the first rounds 2 minuses have turned out are eliminated.

10. Round behind round is selected the strongest participant of game who has answered on большее quantity of questions.

11. On sheet against each surname the teacher registers – who in what round has left and became «a weak link».

12. Game is estimated as much as possible in 0,8 points. The students who have left after first 2 rounds of answers, receive for game of "0" points,

After 3 rounds of answers – «0,2» points,
After 4 rounds of answers – «0,4» points,
After 5 rounds of answers – «0,6» points
The strongest participant receives 0,8 points.
13. The exposed points on report sheet are considered at calculation of a current result of employment as an estimation for a theoretical part.
14. In the bottom free part of magazine the teacher makes entry about game carrying out, the head appends the signature.
15. The game report remains.

SET OF QUESTIONS FOR GAME:

Technology of carrying out of game "Pig in a poke"
For work it is necessary:
1. Sets of variants of tasks
2. Tags for a toss-up on number of students in group.
3. Paper blank leaves

Work course:
1. The general time of game – 60 minutes.
2. All students of group жеребьёвской share on small groups on 3 students in a subgroup.
3. Each subgroup sits down a separate table, prepares a blank leaf of a paper and the handle.
4. On sheet date, group number, faculty, name is written. Students-participants of the given subgroup (the game name).
5. One of participants of each subgroup approaches to the teacher and a beret from an envelope a task variant (for all subgroups about identical).
6. Students copy the task on sheet and the teacher marks time of 15 minutes on work performance.
7. The small groups, everyone in the circle, discuss the task and accurately write down the answer, whenever possible the full.
8. The teacher is obliged to watch strictly, that students didn't write off (this main condition!) also didn't communicate with other subgroups.
9. Upon termination of 15 minutes sheets with answers gather.
10. The teacher during employment checks correctness, completeness and accuracy of performance of the task.
11. On sheet against each surname the teacher registers – who in what round has left and became «a weak link».

12. Game is estimated as much as possible in 0,8 points. The students who have left after first 2 rounds of answers, receive for game of "0" points,

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9. Upon termination of 15 minutes sheets with answers gather.

10. The teacher during employment checks correctness, completeness and accuracy of performance of the task.

11. To all participants small groups the identical point is exposed: As much as possible – 0,8 point.

0,8-0,7 point "5"

0,6-0,4 "4"

0,4-0,1 "3"

0 "2"

12. On sheet of answers the teacher puts a point and the signature.

13. The point got by students is considered at exhibiting of a current result of employment as an estimation for a theoretical part.

14. In the bottom free part of magazine the mark about carrying out of the given business game becomes, the head appends the signature.

15. Reports of works remain the teacher.

SET OF QUESTIONS FOR GAME:

1. LDF method.

2. Rheography method.

3. Gnathodynamometry.

4. Odontoparadentogram.

5. S.E.Gelman's functional chewing test.

6. I.S.Rubinov's functional chewing test.

7. Masticatiography.

8. Intraoral radiologic research methods.

9. Radiovisiograph.

7. METHODS OF CHECK OF COMPREHENSIBILITY AND KNOWLEDGE

  - Oral;

  - Written;

  - Tests.

8. THE ESTIMATED SCALE OF INTERMEDIATE ESTIMATION

Digestition %	Estimation %	Level of knowledge of the student
96-100%	Perfectly «5»	Has full idea about additional meto-dah inspections in orthopedic stomatology. Unmistakably describes rheological methods of research. Objectively realizes informative value of static, functional and graphic methods of research. Has accurate idea about influence of

		functional loading on parodentium and its endurance to chewing pressure. Perfectly knows, what methods are most informative at diagnostics of diseases ВНЧС. Is able to appoint correctly additional methods of research of expediently given pathology. Actively participates in interactive games, is able logically and to think creatively.
91-95%	Perfectly «5»	Has accurate idea about additional meto-dah inspections in orthopedic stomatology. Unmistakably describes rheological methods research. Objectively realizes informative value of static, functional and graphic methods of research. Has correct idea about influence of functional loading on parodentium and its endurance to chewing pressure. Very well knows, what methods are most informative at diagnostics of diseases TMJ. Is able to appoint correctly additional methods of research of expediently given pathology. Actively participates in interactive games, is able logically and to think creatively.
86-90%	Perfectly «5»	Has correct idea about additional methods of inspection in orthopedic stomatolo-gii. Correctly describes rheological methods of research. Objectively realizes informative value of static, functional and graphic methods of research. Has correct idea about influence of functional loading on parodentium and its endurance to chewing pressure. Well knows, what methods are most informative at diagnostics of diseases TMJ. Is able to appoint correctly additional methods of research of expediently given pathology. Actively enough participates in interactive games, is able logically and to think creatively.
81-85%	Well «4»	Has correct idea about additional methods of inspection in orthopedic stomatolo-gii. Correctly describes rheological methods of research. Correctly treats informative value of static, functional and graphic methods of research. Has correct idea about influence of functional loading on parodentium and its endurance to

		chewing pressure. Well knows, what methods are most informative at diagnostics of diseases TMJ. Is able to appoint correctly additional methods of research of expediently given pathology. Actively enough participates in interactive games, but is at a loss in ability logically and creatively to think. Questions answers correctly, but hesitating in answers.
76-80%	Well «4»	Has correct, but not full representation about additional methods of inspection in orthopedic stomatology. Correctly describes rheological methods of research. Correctly treats informative value of static, functional and graphic methods research. Knows about influence functional loadings on parodentium and its endurance to chewing pressure. Knows, what methods are most informative at diagnostics of diseases TMJ. Appoints additional methods of research of expediently given pathology. Actively participates in interactive games, but is at a loss in ability logically and creatively to think. Questions answers correctly, but hesitating in answers.
71-75%	Well «4»	Has not full idea about additional methods of inspection in orthopedic stomatology. Has no accurate representation about rheological methods of research. Understands informative value of static, functional and graphic methods research. Knows about influence functional loadings on parodentium and its endurance to chewing pressure. Knows, what methods are most informative at diagnostics of diseases TMJ. Not actively enough participates in interactive games, is at a loss in ability logically and creatively to think. Questions answers it is incomplete and uncertainly.
66-70%	Satisfactory	Has not full idea about additional methods of inspection in orthopedic stomatology. Has no accurate representation about rheological, static, functional and graphic methods of research. Has no accurate representation about methods of definition of chewing loading. Has the general concept about diagnostics of diseases TMJ. It is not active in interactive games, is at a loss in ability logically and creatively to think. Questions answers it is incomplete and uncertainly.

61-65%	Satisfactory	Has no accurate representation about additional methods of inspection in orthopedic stomatology. Answers questions but commits errors, answers not full, uncertain. It is not active in interactive games commits errors, is at a loss in ability logically and creatively to think. Has insufficiently mastered employment subjects.
55-60%	Satisfactory	Has no accurate representation about additional methods of inspection in orthopedic stomatology. Hardly answers questions, supposes many errors, answers not full, uncertain. It is not active in interactive games, commits errors. Has badly mastered employment subjects.
50-54%	Unsatisfactory	Has no representation about additional methods of inspection in orthopedic stomatology. Can't answer questions, commits plural errors. Didn't participate in interactive games. Has very badly mastered employment subjects.
46-49%	Unsatisfactory	At all have no representation about employment subjects. Didn't answer questions. Didn't participate in interactive games. Hasn't mastered employment subjects.

THE CHRONOLOGICAL CARD OF EMPLOYMENT

№	Employment stages	duration	The form of carrying out of employment
1	Opening address of the teacher (theme substantiation)	5	
2	Homework discussion	20	Explanation of questionnaires
3	Discussion of a theme of employment - the abstract information, семенар, dialogue	40	Семенар, dialogue

4	Participation in interactive games and demonstration of drawings, disks and computer presentations on an employment theme	20	The computer, disks, drawings, interaktiv games
5	The conclusion of the teacher on an employment theme. Estimation of each student on the 100-patient to system and the announcement of estimations. To give to students the task (the collection of questions) for preparation for following employment.	10	Informtsija, the collection of questions for samostojateln oj preparations

10. CONTROL QUESTIONS

1. Stomatoscopy.
2. Electroodontometry.
3. Galvanometry.
4. A hardware method of definition of pathological mobility of teeth.
5. Laser Doppler Flowmetry.
6. Ultrasonic Dopplerography.
7. Rheography.
8. Photoplethysmography.
9. Polarography.
10. Echoosteography.
11. The description of Blek's gnatodinamometre.
12. The description of electronic gnatodinamometre.
13. Definition of chewing efficiency on N.I.Agapov.
14. Definition of chewing efficiency on I. M.Oksmanu.
15. V. K. Kurljandsky's odontoparodontogramm.
16. Hristiansen's chewing test.
17. S.E.Gelman's chewing test.
18. I.S.Rubinov's chewing test.
19. A carrying out technique of masticatiography.
20. Phases of the chewing period.
21. Electromyography.
22. Electromyomasticatiography.

23. Masticatiodinamometry.

24. Myotonometry.

25. Myography.

26. General idea about radiological methods of research.

27. Intraoral contact radiography.

28. Intraoral radiography in occlusion.

29. Tomography.

30. Increased panoramic radiography.

31. Electroroentgenography.

32. Teleradiological research.

33. A computer tomography.

34. Radiography with using of contrast substances.

35. Radiovisiography.

36. Inspection of temporomandibular joint.

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