

**LVIV NATIONAL MEDICAL UNIVERSITY N.A. DANYLO HALYTSKY**

**Department of Physical Training and Sports Medicine**

Approved at the methodical meeting of  
the department of Physical training and sports medicine  
**Head of the department**

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Protocol №1 from 30 of August 2021



**GUIDELINES**

in the discipline

**PHYSICAL REHABILITATION AND SPORTS MEDICINE**

for 3th year students

training of specialists of the second (master's) level higher education in the field  
of knowledge 22 "Health" specialty 221 "Dentistry" for independent work in  
preparation for practical classes

**Topic 2** *"Research and evaluation of the functional state of the tooth-jaw system  
in the dental clinic."*

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Methodical guidelines are made in accordance with the requirements of the curriculum in the discipline "Physical Rehabilitation and Sports Medicine", compiled to train specialists of the second (master's) level of higher education in the field of knowledge 22 "Health" specialty 221 "Dentistry".

According to the curriculum, the study of physical rehabilitation and sports medicine at the medical faculty is carried out in the 3d year of study.

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Methodical guidelines were discussed and approved at the methodical meeting of the Department of Physical Education and Sports Medicine

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## **1. Scientific and methodological substantiation of the topic.**

Determination of the functional state of the tooth-jaw system is the primary task with the primary medical inspection. Only after a thorough examination and analysis of the possibilities of soft tissues and muscles of the maxillofacial area and temporomandibular lower limbs joints, on the basis of methods of functional diagnostics of a condition the tooth-jaw system, physical rehabilitation may be prescribed. Performing functional tests is crucial in expanding the methods of physical rehabilitation. This is possible only for not knowing the knowledge of anatomical and physiological features of soft tissues and muscles located in the maxillofacial area (mimic, chewing gum, tongue, muscles of the palatine and pharyngeal rings, neck) and temporomandibular joints. In this regard, the study and evaluation of the state of the tooth-jaw system is relevant and necessary in the assignment of physical lockouts rehabilitation.

## **2. Educational goal**

### **2.1. The student should know:**

- anatomical and physiological features of soft tissues and muscles, located in the maxillofacial area (mimic, chewing, tongue, muscles of the palatine-pharyngeal ring, neck) and temporal-mandibular joints;
- diagnostic exercises and test kits for detection of the degree of functional disorders of the tooth-jaw system;
- methods of functional diagnostics of the state of the tooth-jaw systems with the help of special chewing gums (according to I.S. Rubinov) and instrumental methods: gnatodynamometry, myotometry, electromyography, masticatiography, measurement of vital capacity lungs.

### **2.2. Be able:**

- To conduct and evaluate the results of special chewing gum samples (according to I.S. Rubinov);
- To conduct and evaluate the results of the instrumental methods of research: gnatodynamometry, myotometry, electromyography, masticatiography, measurement of vital capacity lungs.

### **2.3. Examine practical skills:**

- independently carry out the definition of the functional state tooth-jaw system using special chewing gums (according to I.S. Rubinov);
- independently carry out the definition of the functional state tooth-jaw system using instrumental methods: gnatodinamometry, myotometry, electromyography, masticatiographies, measurements of the lung capacity of the lungs.

### **3. Tips for the student:**

Special exercises for mimic muscles:

1. Pulling the corners of the mouth down and up.
2. Blown by the turn of the right and left cheeks.
3. Lifting eyebrows, wringing your forehead, pinching your eyes.
4. Lifting up and lowering of the lower lip, closing.
5. Extracting lips forward, assembling them in a tube, energetic pulling the corners of the mouth aside.
6. Extraction of the upper lip under the teeth of the upper jaw with simultaneous movement of the lower lip upwards.
7. Facilitating expression of wonder, joy, anger, amount, etc.
8. Opening wide eyes, pinching them one by one, blowing cheeks, dragging them, simulating a smile with the appearance of dental rows.

Special exercises for chewing muscles

1. Slow maximal opening of the mouth.
2. The same with the resistance (back side of the palm support chin).
3. Circular movements of the lower jaw (chip to indicate the letter "O").
4. Lateral movements of the lower jaw (with closed and open mouth).
5. Lifting the lower jaw forward (with closed and open mouth)
6. Same with resistance (with index and middle fingers stomp in chin).
7. Maximum opening of the mouth with the help of thumbs (the nail phalanges of the big fingers skid in the upper and lower cutters)
8. Chewing candy such as iris or chewing gum (3-5 minutes).
9. Static strain of chewing muscles without opening your mouth (firmly compress your teeth on two bills and slowly tighten them).

10. Opening your mouth with a deep breath through the mouth (yawning).

11. Maximally frequent opening of the mouth with uttering "pa-pope".

To study the function of chewing and swallowing in dentistry have found application methods that take into account the kind of bite, the intensity of chewing, the strength of chewing pressure, the effect of saliva and the role tongue in the formation of a breastfeed.

### **Chewing Samples**

The first functional test was developed by Christinism and based on taking into account when chewing the degree of grinding 5 g wood or coconut. After 50 chewing gum walks collected in a cup, washed, dried and sifted through a sieve with holes of different sizes. Chewing efficacy is determined by the amount of unspotted residue. S.E. Gelman modified this method by establishing that the person with a full-fledged chewing gum that has one hundred percent weight chewy, chew well with 5 grams of almond throughout 50 s, crushing them during this time to the fact that the weighed mass after drying passes through a sieve with holes, the diameter of which is equal to 2.4 mm. To the product that can be used for Chewing gum tests have been made. Shares that formed after chilling, do not dissolve in saliva, decrease in volume after drying in a water bath and glued. These requirements were largely consistent with almonds that and was proposed for this purpose by SE Gelman.

Technique of conducting a test. Weigh 5 grams of almonds. Investigating sits at the table, on which there is a small cup and a glass of boiled water water at room temperature (14-16 ° C). He is offered to take in mouth all 5 grams of almonds and start chewing after the signal. The beginning of chewing is noted on the stopwatch. After 50 seconds give a signal by which the subject ceases to chew and spit out All the mass in a cup, then he rinses his mouth and spills water in that the cup itself If the patient has removable dentures, then they are removed from mouth and rinse over the same cup. In a cup, pour 5-10 drops of 5% soluble solution for disinfection. It is very important that during the research in the laboratory it was calm situation. The investigator should sit calmly, not hurry, do not be nervous. Processing of the obtained sample. The resulting mass is filtered through gauze For this purpose, a glass or metal funnel of medium size (8- 10 cm in diameter) are inserted into a glass hollow cylinder or in a simple bottle. Gauze squares moisten with water and apply to the funnel so that the gauze is sagged, and its free edges descend over edge of funnel. The gauze's left hand is pressed to the edge of the funnel, and right pour the contents of the cup on the gauze. If on the bottom of the cup there is a precipitate, it is necessary to pour in a little water in it, to

shake and quickly pour on gauze. After straining gauze with residual sediment put in medium-sized porcelain cup or teapot. For drying the mass of the cup with gauze is transferred to a water bath. Not you can do this in a dry oven, because hot air can cause change in shape and particle weight. The mass is considered to be dried, if stirring between fingers it causes a feeling of dryness and easy to crumble. During drying should be monitored so that the water bath does not boil water, because it can lead to overdrive or even to charcoal mass.

For sifting the dried mass, use a metal sieve oval holes with a diameter of 2.4 mm. Sieve put on dry cup, pour the whole mass, gently stir and shaking, sucked away sifting should be done carefully, often stirring the mass, best wooden stick, so that through the holes passed all pretty shredded pieces. On the sieve there are only particles whose diameter is larger than diameter openings, gently pour them on a glass and weigh them to one hundredth of a gram.

Further development of a functional chewing gum test was carried out I.S. Ruby Unlike the methodology of SE Gelman, he offered instead 5 grams of almonds 800 mg of hazelnut that approximately equal to the volume of one nucleus of almonds.

Technique of conducting a test. The subjects are given 800 mg of forest walnuts and suggest it chew until the reflex is swallowed. The walnut time is calculated by the stopwatch. As only in the subject there is a desire to swallow the chewed Nut, they are offered to spill the contents of the oral cavity into a cup. Processing of the resulting mass is carried out as in the case of SE. Gelman.

As a result of the functional test IS Rubinova get 2 indicators: 1) the percentage of chewing of food (chewing efficiency; 2) time of chewing.

On the basis of conducted research, it was found that the average the duration of chewing (before swallowing) one nut shell weighing 800 mg averaged 14 seconds and the rest in the sieves equal to 0.

**Gnatodynamometry method of research chewing the effectiveness of teeth** - a method for determining the amount of chewing pressure on various teeth of the tooth row and in the whole of the tooth row (in kg). Positive dynamics is characterized by an increase in chewing gum pressure mechanical gnatodynamometer with long ones was designed the cheeks that the patient under study grips with his teeth.

**Myotometry** - a method for determining the tone of chewing muscles when different states. About the degree of tension (density) of muscles judged by the force with which immerse the probe of the device (myometometer) at a given depth. The arrows of the dial of the

myotometer show muscle tone in grams. In normal tone will rest alone the chewing muscle most often reaches 40 g, and the tone of the same muscle when squeezing its own dentitions during central switching fluctuates within 180-240 g. At improving the functional state increases the amplitude and indicator of muscle tone (difference between stress and relaxation). When tired (fatigue) the amplitude decreases, the rest tone rises. The data of myometometry show that the tone the muscles of the chewing apparatus is prone to individual oscillations and changes in the process of orthopedic treatment.

**Electromyography** - record of muscle biopotentials for the purpose study of their physiological activity. With the help of an electromyographic study it is possible to determine disturbance of the functions of masticatory and mimic muscles at rest; at the pressure and movements of the lower jaw. To study the condition of the muscles, use superficial or needle electrodes Surface electrodes are located in the center muscle contraction Identities of electromyographic research they achieve an overlay of electrodes with the same distance between them. For this, the electrodes are placed in special devices with elastic plastic or other material and impose on one and the same the same skin areas. Before applying the electrodes are appropriate the skin areas are carefully rubbed with alcohol and apply a special paste After palpation detection of the muscle contraction center on the skin of the face marks the moving point. To the angle of the lower jaw apply an angle meter and on its scale determine the location defined on the face of the point in the horizontal and vertical directions. The received coordinates are recorded on the map of the survey and take into account in the future. In the study of temporal muscles, electrodes can be imposed on front, middle or rear part of the right and left, with the study of the circular muscle of the mouth - on the middle sections of the upper and lower lower lip, in the study of pectoral muscle - in the area chin.

The activity of paired muscles is desirable to be recorded at the physiological rest, in tension, including those with compressed teeth rows, with different movements of the lower jaw. It is of interest study of electrical activity of the muscles when chewing, involuntary swallowing, swallowing tasks. Investigation of bioelectric activity of chewing muscles that surround dental rows, it is possible to find out the effect of their function on bite formation according to the records, you can trace the interconnection reflex reductions of chewing muscles. Electromyogram are evaluated according to form, amplitude and temporal indicators. The amplitude gives an idea of the strength characteristics of the muscles. Analysis electromyogram of muscles allows to study co-ordination the activity of muscle antagonists

and muscle-synergists. Comparison electromyogram of the muscles of the right and left sides allows you to set chewing type, reveal coordination of muscles on both sides.

### **Graphic methods for the study of chewing movements of the mandible**

**Masticography** (latin masticatio - chewing, grapho - write) - a method of functional diagnostics that allows graphically depict the normal motor activity of the mandible, its violation and recovery dynamics. Now the record of chewing movements of the lower jaw can be done on different devices: kymograph, oscilloscope, etc. I.S. Rubinov has developed a record of chewing movements of the lower jaw (masticography) and decipher the meaning of each component parts of the graphic record. The analysis of masticationograms allows us to determine that it consists of consecutive wavy curves, conventionally called masticatory waves. In a chewing wave, there is a rising and descending lap. The first is associated with the lowering of the mandible, the second one is from her the ascent each wave is characterized by a height, the angle between the ascending and downward character of the peak. Lower loops between individual waves called loop closures. The closing loop (occlusive playground) also has its own characteristic. It may have the appearance of an equal line, and may have an auxiliary wave indicating a lateral shift of the mandible.

In each separate chewing period, 5 phases are distinguished.

The first phase (I) is the resting phase of the mandible - the lips are closed, as well dental rows not closed. At mastication, this phase is expressed straight line

The second phase (II) corresponds to the time when the food is fed into the oral cavity, during which the lower jaw falls down, with the curve sharply rises upwards.

The third phase (III) is indicative, corresponds to the adaptation to chewing food. In this phase, the curve forms the masticationogram several teeth corresponding to squeezing the food breast before cheesy

In the fourth phase (IV) - the time of the main chewing function - the record looks like a rhythmic alternation of the same type of chewing waves. On the lower teeth appear loops closing, corresponding to compression jaws for food suppression. For her with her teeth and theirs. The correct closure is characterized by the rhythm of chewing waves and their same scale.

The fifth phase (V) corresponds to the formation and swallowing of the raged food - chewing waves become shorter and less rhythmic. After swallowing food again, the state of rest of the lower jaw.



## **Methods of study of temporomandibular joint**

**Arthropophonography** - auscultation method of the temporomandibular musculoskeletal system joints to detect noise, crunch and clicks in them, as well differential diagnostics of functional and morphological violations an important diagnostic feature of dysfunction of the temporal-mandibular joint is precisely the presence of noise phenomena, such as like clicks, crepitation, etc.

Noise phenomena in the region of the temporomandibular joint arise when movements of the lower jaw: opening and closing mouth the mechanism of a click or crunch is associated with the interaction of the head of the lower jaw and articular disk.

**Myoarthrophy** is a method of simultaneous registration of abbreviations chewing muscles and joints of the lower jaw heads in temporomandibular joints using an electron myoarthrograph. Myoarthrophy allows you to distinguish waves of muscle contractions and waves, arising from movements of the lower jaw.

### **4. Control issues:**

1. Anatomical and physiological features of soft tissues and muscles, located in the maxillofacial area (mimic, chewing muscles, tongue, muscles of the palatine-pharyngeal ring, neck)
2. Anatomical-physiological features of the temporomandibulum joints
3. Examine special exercises for mimic and chewing muscles
4. Diagnostic physical exercises and test complexes for detection the degree of functional disorders of the tooth-jaw system.
5. Methods of functional diagnostics of the condition of the tooth-jaw systems using special chewing exercises.
6. Instrumental methods of research of the tooth-jaw system: gnatodynamometry, myometoneometry, electromyography
7. Graphic methods for the study of chewing movements of the lower jaw (masticography).
8. Methods of study of the temporomandibular joint (arthropophonography, myoarthrophy).

### **5. Literature:**

#### **5.1. Basic:**

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