

**MINISTRY OF HEALTH OF THE REPUBLIC OF BELARUS
BELARUSIAN STATE MEDICAL UNIVERSITY**

APPROVED by

Associate professor Ya. I. Timchuk
Head of the Dpt., Ph.D.



**METHODOLOGY TEXTS FOR PRACTICAL CLASSES
Maxillofacial orthopedics and orthopedic dentistry**

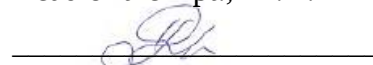
(5 course 9 semester)

For the specialty: **1-79 01 07 «Dentistry»**

Discussed at the meeting of the
Department of Orthopedic
Dentistry and Orthodontics
(Protocol №_1_, 31.08.2026)

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Protocol of the department meeting
No. 1 dated 31.08.2026

**Thematic plan of practical classes
on the subject "Maxillofacial orthopedics and orthopedic dentistry"
for the 5th year students of the 9th semester**

1. Principles and features of pathogenetic treatment of dental anomalies in the formed bite. Application of surgical, physical and physical-pharmacological methods in the complex treatment of dental anomalies.

Hygienic hand rubbing. Filling in the patient's medical documentation. Filling in the training patient's job order during the orthopedic appointment.

2. Orthopedic treatment of the dental system anomalies in adult patients.

Selection of maxillofacial devices and prostheses for the treatment of patients with the dental system anomalies

3. Orthopedic treatments for pseudoarthrosis, malunion fractures, bone defects, microstomia.

Diagnosis and treatment planning for patients.

4. Deformations of dental arches and bite. Etiology, pathogenesis, diagnostics, clinical manifestations. Treatment methods of deformations of dental arches and bite.

Diagnosis and treatment planning for patients.

5. Orthopedic treatment methods for congenital and acquired defects of the palate.

Selection of maxillofacial appliances and prostheses for the treatment of patients with palate defects

6. Orthopedic treatment in jaw resections. Orthopedic treatment for facial defects and injuries.

Diagnosis and treatment planning for patients.

7. Dental implants. Characteristics. Indications and contraindications. Main types of dental implants.

Planning orthopedic treatment of patients with anodontia with fixed dental prosthesis structures supported by dental implants using cone-beam computed tomography

8. Features of prosthetics using dental implants in the manufacture of fixed dentures.

Planning orthopedic treatment of patients with anodontia with fixed dental prosthesis structures supported by dental implants using cone-beam computed tomography

9. Features of prosthetics using dental implants in the manufacture of removable dentures.

Orthopedic treatment planning for patients with anodontia with removable dental prosthesis structures supported by dental implants using cone beam computed tomography.

10. Features of orthopedic treatment in patients with diseases of the oral mucosa.

Diagnosis and treatment planning for patients.

11. Pathological changes in the state of the body, tissues and organs of the oral cavity associated with the presence of dentures. Galvanosis. Etiology, pathogenesis, clinical manifestations, prevention, treatment methods.

Diagnosis and treatment planning for patients.

12. Pathological changes in the condition of the body, tissues and organs of the oral cavity associated with the presence of dentures. Allergies. Etiology, pathogenesis, clinical manifestations, prevention, treatment methods.

Diagnosis and treatment planning for patients.

13. Increased tooth abrasion. Etiology, pathogenesis, clinical manifestations, diagnostics and classification.

Diagnosis and treatment planning for patients.

14. Methods of orthopedic treatment of patients with increased tooth abrasion.

Diagnosis and treatment planning for patients.

15. Orthopedic treatment of patients with increased tooth abrasion complicated by TMJ dysfunction.

Diagnosis and treatment planning for patients.

16. Diagnostics and treatment of patients with TMJ diseases. Etiology, pathogenesis, clinical manifestations, differential diagnostics, orthopedic treatment methods.

Diagnosis and treatment planning for patients.

Lectures – 2 (3 hours)

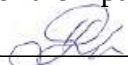
Practical classes – 112 hours

Number of weeks – 16

Final certification – Differentiated credit

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Protocol of the department meeting
No. 1_, 31.08.2026

**Thematic plan of lectures for the 5th year students of the 9th semester
on the subject "Maxillofacial orthopedics and orthopedic dentistry"
(2 lectures, 3 hours)**

1. Maxillofacial orthopedics
 2. Galvanoses and allergies to prosthetic dental materials.
- Orthopedic treatment of adentia using dental implants

Lectures – 2 (3 hours)

Practical classes – 112

Weeks – 16

Final certification – Differentiated credit

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.

3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 30 p.

4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

BELARUS STATE MEDICAL UNIVERSITY, DENTAL FACULTY
EXAMINATIONAL SHEET
of practical skills in the discipline « Maxillofacial orthopedics and orthopedic dentistry»

Course **5** Semester **9** Group

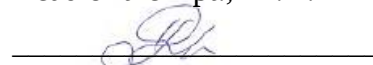
Lecturer's full name	Full names of the certification committee members		Date		
Planned acquisition of practical skills	Value in points	Progress notes (“yes”, “no”)		commi tee	Total points
		student	lecturer		
1. Use examination methods in patients with dental arch deformities:					
1.1 Interview of patient	3				
1.2 Evaluation of facial features	3				
1.3 Alteration of the face lower part height	3				
1.4 Palpation of the masticatory muscles	3				
1.5 TMJ palpation	3				
1.6 Examination of the oral cavity, conducting instrumental studies	3				
2. Determine the indications for prosthetics and choose a rational treatment method for patients:					
2.1 With deformations of the dental arches	4				
2.2 With chronic diseases of the oral mucosa	4				
2.3 With allergies and galvanoses	4				
2.4 With increased abrasion	4				
2.5 With TMJ diseases	4				
2.6 With maxillofacial pathology	4				
2.7. With the application of dental implants	4				
3. Eliminate occlusal obstacles in patients with TMJ disorders	4				
4. Examination of patients with galvanosis and allergic intolerance to dental materials					
4.1 history taking, clinical examination	3				
4.2 measurement of potential difference of metal structures in the oral cavity	3				
4.3 Analysis of skin allergy testing results and mast cell degranulation reaction	3				
4.4 differential diagnostics of pathological changes associated with the presence of dentures	3				
4.5 final diagnosis and selecting materials for rational prosthetics	3				
5. Be able to fit and apply the following orthodontic appliances:					
5.1 Removable protective plate	5				
5.2 Plastic mouthguards	5				
6. To be able to diagnose injuries of the maxillofacial region.	5				
7. Choosing prostheses to treat patients with deformities of the dental system.	5				
8. Choosing maxillofacial devices and prostheses to treat patients with palate defects.	5				
9. Planning orthopedic treatment of patients with anodontia with fixed dental prosthesis structures supported by dental implants	5				
10. Planning orthopedic treatment of patients with anodontia with removable dental prosthesis structures supported by dental implants	5				

Total points **Mark**

Signatures: _____

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CRITERIA FOR ASSESSING STUDENTS' KNOWLEDGE USING 10-POINT SCALE

10 points – ten:

- systematized, deep and complete knowledge in all sections of the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", as well as **the main issues** beyond it;

- **accurate** use of scientific terminology (in the foreign language in particular), stylistically competent, logically correct presentation of the answer to questions on the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **impeccable proficiency** in the tools for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", the ability to use them effectively in setting and solving scientific and professional problems;

- **pronounced ability** to solve complex problems independently and creatively in a non-standard situation in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **complete and deep mastering the main and additional literature** recommended by the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **the ability to navigate** the theories, concepts and trends in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry" and assess them critically, use scientific achievements of other dental disciplines;

- **creative independent work** in practical, laboratory classes in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", **active** participation in group discussions, high level of culture of completing assignments.

9 points – nine:

- systematized, deep and complete knowledge in all sections of the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **accurate** use of scientific terminology (in the foreign language in particular), stylistically competent, logically correct presentation of the answer to questions;

- **proficiency** in the tools for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", the ability to use them effectively in setting and solving scientific and professional problems;

- **the ability** to solve complex problems independently and creatively in a non-standard situation in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **complete mastering the main and additional literature** recommended by the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **the ability to navigate** the theories, concepts and trends in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry" and assess them critically;

- **independent work** in practical, laboratory classes in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", **creative** participation in group discussions, high level of culture of completing assignments.

8 points – eight:

- systematized, deep and complete knowledge in all sections of the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- use of scientific terminology (in the foreign language in particular), linguistically and logically correct presentation of the answer to questions; ability to draw **substantiated** conclusions;

- **proficiency** in the tools for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", the ability to use them in setting and solving scientific and professional problems;

- **the ability** to solve complex problems independently within the curriculum in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **mastering the main and additional literature** recommended by the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **the ability to navigate** the theories, concepts and trends in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry" and assess them critically;

- **independent work** in practical, laboratory classes in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry», participation in group discussions, high level of culture of completing assignments.

7 points – seven:

- systematized and complete knowledge in all sections of the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- use of scientific terminology, stylistically correct, logically correct presentation of answers to questions, the ability to draw **substantiated** conclusions;

- **proficiency** in the tools for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", the ability to use them in solving educational and professional problems;

- **fluency in typical solutions** within the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **mastering the basic and necessary additional** literature recommended by the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **the ability to navigate the main** theories, concepts and directions in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry" and give them a comparative assessment;

- **independent work** in practical and laboratory classes, participation in group discussions, high level of culture in completing assignments in the discipline "Maxillofacial orthopedics and orthopedic dentistry".

6 point – six

- **sufficiently** complete and systematized knowledge within the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- use of the necessary scientific terminology, stylistically correct, logically correct presentation of answers to questions, the ability to draw **substantiated** conclusions on the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **proficiency** in the tools for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", the ability to use them in solving educational and professional problems;

- **the ability** to apply independently standard solutions within the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **mastering the main** literature recommended by the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- **the ability to navigate the basic** theories, concepts and directions in the discipline "Maxillofacial orthopedics and orthopedic dentistry" and give them a comparative assessment;

- **active independent work** in practical, laboratory classes, periodic participation in group discussions, a high level of culture in completing assignments in the discipline "Maxillofacial orthopedics and orthopedic dentistry".

5 points – five:

- sufficient knowledge within the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";

- use of scientific terminology, stylistically correct, logically correct presentation of answers to questions, the ability to draw conclusions;

- **proficiency** in the tools for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", the ability to use them in solving educational and professional problems;
- **the ability** to apply independently standard solutions within the framework of the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";
- **mastering the main** literature recommended by the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";
- **the ability to navigate the basic** theories, concepts and directions in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry" and give them a comparative assessment; - **independent work** in practical and laboratory classes, participation in group discussions, **high level of culture** in completing assignments in the discipline "Maxillofacial orthopedics and orthopedic dentistry".

4 points – four, PASSED:

- sufficient knowledge within the educational standard;
- **mastering the basic** literature recommended by the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";
- use of scientific terminology, stylistic and logical presentation of answers to questions, the ability to draw conclusions without significant errors in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";
- **proficiency** in the tools for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", the ability to use them in solving standard (typical) problems;
- **the ability** to solve standard (typical) problems in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry" under the guidance of a lecturer;
- **the ability to navigate** the main theories, concepts and directions in the discipline "Maxillofacial orthopedics and orthopedic dentistry" and evaluate them;
- **work** under the guidance of a lecturer in practical, laboratory classes, an acceptable level of culture in completing assignments in the discipline "Maxillofacial orthopedics and orthopedic dentistry".

3 points – three, FAILED:

- insufficiently complete level of knowledge within the educational standard;
- **fragmentary mastering** of the basic literature recommended by the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";
- use of scientific terminology, presentation of the answer to the question with significant linguistic and logical errors in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";
- **poor proficiency** in the tools for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", incompetence in solving standard (typical) problems;
- **inability to navigate the main** theories, concepts and directions in the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";
- **passivity** in practical and laboratory classes, **low level of culture** in completing assignments in the discipline "Maxillofacial orthopedics and orthopedic dentistry".

The level is insufficient for current and final certification, the current recertification is allowed with the appropriate independent work of a student.

2 points – two, failed:

- **fragmentary knowledge** within the educational standard;
- **knowledge of some** literary sources recommended by the curriculum for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry";
- inability to use scientific terminology for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry", the presence of **gross stylistic and logical errors** in the answer;
- **passivity** in practical, laboratory classes, **low level of culture** in completing assignments for the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry".

The level is insufficient for current and final certification, the current recertification is allowed with significant independent work of a student on the discipline "Maxillofacial Orthopedics and Orthopedic Dentistry".

1 point – one, FAILED:

- lack of gaining knowledge and competence within the educational standard or refusal to answer;

- use of prohibited (unauthorized) materials and methods.

The student is not re-certified and is presented to be expelled from the higher educational institution

TOTAL CLASS TIME – 7 academic hours (280 minutes).

CLASS PLANNING
5 course, 9 semester

№	Stages of a practical class	Time in min.
1.	Organisation stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing of practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of practical skill	58
6.	Final stage	13

Methods and forms of teaching used

Linear (traditional) method;
active (interactive) methods:
Problem-Based Learning (PBL);
Case-Based Learning (CBL);
simulation-based learning.

Equipment list

1. Dentist's study area (table, chair).
2. Dental unit with lamp and spittoon.
3. Instrument table with fixed rigid container for class B waste.
4. Dentist's chair (for a doctor).
5. Trolley with consumables and containers for disposal.
6. Sink.
7. Container for collecting class A waste with a capacity of 10 liters.
8. Container for collecting class B waste with a capacity of 10 liters.
9. A set of instruments in imitation sterile packaging (tray - 1 pc., dental tweezers - 2 pcs., dental mirror - 1 pc., dental probe - 1 pc., excavator - 1 pc., spatula - 1 pc., trowel - 1 pc., angular probe - 1 pc.
10. A set of cutting instruments for preparing teeth using a turbine tip.
11. Paper palette for mixing the second layer of silicone mass.
12. Rubber flask for mixing impression materials.
13. Spatula for mixing impression materials.

14. Dental spatula
15. Impression trays for the upper and lower jaw.
16. Scalpel.
17. Retraction thread.
18. Silicone impression material.
19. Alginate impression material.
20. Plaster.

Organization of students' independent work

The time allocated for independent work may be used by students for:

- preparing for lectures, seminars, practical and laboratory classes;
- preparing for colloquiums, tests and exams in the academic discipline;
- studying topics (questions) submitted for independent study;
- solving problems;
- completing research and creative assignments;
- preparing thematic reports, essays, presentations;
- completing practical assignments;
- taking notes on the educational literature;
- preparing reports;
- compiling a review of scientific literature on the given topic;
- designing information and demonstration materials (stands, posters, graphs, tables, newspapers, etc.);
- making models, laboratory and teaching aids;
- compiling a thematic selection of literary sources, Internet sources.

LESSON 1

Subject: Principles and features of pathogenetic treatment of dentoalveolar anomalies in the formed bite. Application of surgical, physical and physical-pharmacological methods in the complex treatment of dentoalveolar anomalies

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to study the principles and features of pathogenetic treatment of dentoalveolar anomalies in the formed bite, to familiarize students with surgical, physical and physical-pharmacological methods in the complex treatment of the dentoalveolar anomalies.

Objectives of the lesson:

1. To teach student the specifics of treating dental anomalies in the formed bite.
2. To get acquainted with the methods of treating dental anomalies (surgical, physical, physical and pharmacological) in the formed bite.
3. To get acquainted with the integrated approach to treating dental anomalies in the formed bite.
4. To get acquainted with possible relapses in orthodontic treatment of dental anomalies in the formed bite.
5. To consolidate knowledge of the retention period, options for retention measures.

Class location - the clinical setting.

Practical skills mastered during the class:

Hygienic hand rubbing. Filling in the patient's medical documentation. Filling in the training patient's job order during the orthopedic appointment.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from anatomy: the anatomical structure of the teeth, dental arches and jaws;
- from histology: the structure of the oral mucosa;
- from general dentistry: new technologies and modern construction materials in the manufacture of fixed and removable dentures;

- from orthopedic dentistry (fixed prosthetics): partial adentia, defects of the dental arches, principles of transmitting chewing pressure by various types of dentures.

Control questions from related disciplines:

1. Methodology for examining an orthodontic patient.
2. Making a diagnosis and justifying it.
3. Types of bite and their characteristics.

Control questions:

1. Features of treatment of the dentoalveolar anomalies in the formed bite.
2. Methods of treatment of the dentoalveolar anomalies (surgical, physical, physical-pharmacological) in the formed bite.
3. Integrated approach to treatment of the dentoalveolar anomalies in the formed bite as a way to optimize orthodontic treatment of adults.
4. Relapses in orthodontic treatment of anomalies of the dentoalveolar system in the formed bite.
5. Retention period. Variants of retention measures

Treatment of malocclusion in adults presents certain difficulties, which are associated not so much with orthodontic treatment but mainly with frequent relapses. This is largely due to age-related anatomical, physiological and morphological features of the formed bite. With age, bone density increases, its plasticity decreases, and metabolic processes in it slow down. In addition to resorption and apposition in bone tissue remodeling, its elasticity, which decreases with age, is of great importance. All this creates difficulties in bone tissue remodeling, and the use of orthodontic devices alone does not always give the desired result. In this case, it is advisable to carry out complex treatment, that is, along with orthodontic, use surgical, pharmacological, physical and physical-pharmacological methods. Thus, from surgical methods, the compactosteotomy method is used, which consists in multiple damage to the compact bone layer on a large surface in the area of the teeth to be moved. Preliminary compact osteotomy is designed not only to weaken the mechanical strength of the bone, but also to stimulate the biological activity of bone tissue. Strengthening the regenerative-proliferative processes in response to surgical intervention creates favorable conditions for orthodontic treatment. Newly formed bone tissue becomes a retention factor in the treatment of dental anomalies in adults.

In the retention period, physical factors (radiation from a helium-neon laser) or pharmacological factors (calcium chloride or gluconate) are usually used.

A comprehensive treatment plan for adult patients with malocclusions should include:

1. Creating conditions for faster bone tissue remodeling and preventing relapses.
2. Carrying out orthodontic treatment with the equipment.
3. Optimizing the bone tissue apposition conditions during the retention period.
4. Prosthetic measures as indicated.

Relapse is a tendency for teeth to move from the position achieved during orthodontic treatment; retention is maintaining teeth in the position achieved by orthodontic treatment for a period of time necessary to stabilize the result.

Peculiarities of dental anomalies treatment in adults

Treatment of dental anomalies in adults has its own characteristics, which are due to a number of the following factors:

- orthodontic treatment is carried out during the period of complete formation of the facial skeleton;
- bone tissue at this age is less pliable and is more difficult to rebuild during orthodontic treatment;
- dental deformities are aggravated by defects and secondary deformation of the dentition;

- orthodontic treatment is longer than in children;
- relapses often occur after orthodontic treatment of anomalies;
- adult patients find it more difficult to get used to orthodontic devices;
- not all types of dental anomalies in adults are amenable to purely orthodontic treatment;
- sometimes treatment can be carried out against the background of affected periodontium.

The above factors prompted the development and use of complex methods for treating dental anomalies and deformities in adults.

Reducing the time and improving the quality of orthodontic treatment of dentoalveolar anomalies in the formed bite is possible due to the optimization of not only the active but also the retention period. Bone tissue reacts sensitively to various physical and pharmacological effects. The basis for the restructuring of bone tissue is its resorption and apposition. Various methods and means that affect the mineral and cellular composition of the bone tissue are of great importance. By changing the mineral and cellular composition, it is possible to achieve acceleration of physiological and reparative regeneration of the bone tissue. For this purpose, various physical methods and drugs have been proposed that act both locally and on the entire body as a whole, stimulating the activity of metabolic processes.

A large number of studies have been devoted to the issue of stimulating bone tissue regeneration. Physical stimulation factors include ultraviolet irradiation, exposure to an ultra-high frequency (UHF) electric field, the use of a helium-neon laser, and magnetic therapy. Direct electric current, laser therapy, dosed vacuum, and ultrasound are also used.

For this purpose, various medications are used (thyrocalcitonin, vanadium, manganese sulfate in combination with vitamin B1). Such a method as drug electrophoresis has also proven to be very promising.

Of the medications, vitamins and hormones that affect the general phosphorus-calcium metabolism and collagen synthesis in bone tissue, as well as various calcium-containing drugs locally, are used. Calcium salt of phytic acid has a good ability to restore calcium content in tissues and has a positive effect on the formation of the bone tissue. Osteocare replenishes calcium deficiency and accelerates mineralization of bone tissue. Calcium gluconate is used in case of calcium ion deficiency to restore bone tissue; it has a lesser local irritant effect, and calcium ion metabolism is better when taken with vitamin D.

The results of orthodontic treatment may be unstable due to the following factors:

- physiological mesial movement of the teeth;
- condition of the gums and periodontal tissues;
- neuromuscular effects;
- eruption of third molars.

The retention period is necessary to:

1. Provide the periodontal and gum tissues with sufficient time for restructuring.
2. Promote neuromuscular adaptation to the correct position of the teeth.
3. Maintain the still unstable position of the teeth.

SITUATIONAL TASKS

1. Patient A., 16 years old, complains of a strongly protruding left upper canine. Objectively: tooth 23 was in supraocclusion. Orthognathic bite. There are no defects in the dental arches. Make a diagnosis and justify the orthodontic treatment plan.

2. Patient R., 13 years old, came with a diastema between the teeth 11 and 21. Objectively: there is a pronounced diastema in the area of the teeth 11 and 21 (the distance between them is 6 mm). Orthognathic bite. There are no defects in the dental arches. Make a diagnosis and justify the orthodontic treatment plan.

3. Patient H., 20 years old, complains of having a severely narrowed upper jaw. Objectively: there is a severe narrowing in the lateral parts of the upper jaw, the lower lateral teeth overlap the upper ones. In the frontal part, the upper teeth overlap the lower ones. There are no defects in the dental arches. Make a diagnosis and justify the orthodontic treatment plan.

4. Patient P., 34 years old, complains of the lower jaw teeth crowding. 5 years ago, she was treated by an orthodontist using a multibonding system. Objectively: crowding of the lower jaw frontal group of teeth, recession of 3.3 and 4.3. Orthognathic bite. There are no defects in the dental arches. There is no retention apparatus. Make a diagnosis and justify the orthodontic treatment plan. What recommendations can be given to the patient?

5. Patient T., 19 years old, complains of pain in the retromalar space, the appearance of which she noted 10 days ago, she also noticed crowding in the frontal part of the dentition. Objectively: orthognathic bite. There are no defects in the dental arches. Intact dentition. Make a diagnosis and plan treatment. What recommendations can be given to the patient. What additional research methods have to be carried out?

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

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4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 2

Subject: 2. Orthopedic treatment of the dental system anomalies in adult patients.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to study and master methods of prosthetics for anomalies of the dental system in adults.

Objectives of the lesson:

1. To study the indications for orthopedic treatment of the dentoalveolar system anomalies in the formed bite.
2. To get acquainted with orthopedic treatment for anomalies of the position of individual teeth in adults.
3. To consolidate knowledge of orthopedic treatment for vertical bite anomalies (deep bite, open bite).
4. To study orthopedic treatment for sagittal bite anomalies (prognathia, progenia).
5. To study orthopedic treatment for transverse bite anomalies (crossbite).

Class location - the clinical setting.

Practical skills mastered during the class:

Selection of maxillofacial devices and prostheses for the treatment of patients with the dental system anomalies.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from anatomy: the anatomical structure of the teeth, dental arches and jaws;
- from histology: the structure of the oral mucosa;
- from general dentistry: new technologies and modern construction materials in the manufacturing partial removable dentures;
- from orthopedic dentistry (fixed prosthetics): partial adontoma, defects of the dental arches, principles of transmitting chewing pressure by various types of dentures.

- from physiology: have knowledge of the the function of the TMJ, muscles of the maxillofacial region.

Control questions from related disciplines:

1. Anatomy and morphology of the dental system.
2. Bite and its varieties.
3. Pathogenesis of dental anomalies.
4. Examination of a patient in an orthopedic dentistry clinic.

Control questions:

1. Indications for Prosthetic treatment for anomalies of the dentoalveolar system in the formed bite.
2. Prosthetic treatment for anomalies of the position of individual teeth in adults.
3. Prosthetic treatment for vertical bite anomalies (deep bite, open bite).
4. Prosthetic treatment for sagittal bite anomalies (prognathia, progenia).
5. Prosthetic treatment for transverse bite anomalies (crossbite).

Indications for the use of Prosthetic treatment:

1. Skeletal forms of anomaly not subject to orthodontic treatment, and the patient's refusal of surgical intervention.
2. Combination of anomaly with the absence of a large number of teeth.
3. Impossibility of orthodontic treatment.
4. Ineffectiveness of previously performed orthodontic treatment.
5. Refusal of orthodontic treatment.
6. Combination of bite anomaly with a pronounced systemic disease.

Prosthetic treatment of the deep bite.

The main tasks of orthopedic treatment of patients with deep bite are the elimination of damage to the mucous membrane of the hard palate and the gingival margin in the area of the lower front teeth; creation of sliding occlusion of the dental arches; reduction of functional overload of the teeth; creation of support for the front teeth, restoration of the height of the lower part of the face.

Before prosthetics, the occlusal surface of the dental arches is leveled by grinding down the hard tissues of the anterior teeth and the sharp cusps of the premolars and molars. If some teeth are missing, depending on the size and topography of the defect, removable dentures with a cast base and occlusal pads or solid cast bridge dentures are used. The orthopedic method is also used for intact dental arches. It is most effective for deep skeletal bite of form 1. Reducing the height of the lower part of the face and the presence of a large interocclusal distance allows eliminating damage to the mucous membrane of the hard palate by prosthetics with restoration of the height of the lower part of the face.

In patients with deep skeletal bite of form 2, this method is used if it is necessary to to make prosthetics of the anterior teeth with crowns. By changing the axial direction of the teeth, a decrease in the depth of overlap is achieved and, in some cases, the creation of an incisal-tubercular contact is achieved.

Prosthetic treatment of the open bite.

Orthopedic treatment is indicated for open skeletal bite caused by a change in the position of the upper jaw, deformation of the lower jaw and insufficient height of the alveolar processes. Orthopedic methods include reducing the interalveolar height by grinding down the teeth that hold it, and prosthetics with an increase in the height of the clinical crowns of teeth located outside the occlusion.

If the dental arches are intact, prosthetics consists of creating contact between the antagonist teeth using fixed and removable dentures. Fixed dentures include porcelain and metal-

ceramic crowns, while removable dentures include clasp dentures with occlusal overlays. Prosthetics in the case of a combination of anomaly and the absence of some teeth consists of restoring the continuity of the dental arches while simultaneously creating occlusal contact between the remaining teeth.

Prosthetic treatment of the crossbite.

Orthopedic treatment is performed in case of the skeletal form of the anomaly and the patient's refusal of other types of treatment. In case of integrity of the dental arches and crossbite caused by their irregular shape, prosthetics of the lateral teeth is performed with artificial crowns (solid-cast combined or metal-ceramic). If the depth of the teeth overlap is significant in the place where the anomaly is observed, then it becomes necessary to shorten the clinical crown with or without depulpation. In the absence of teeth, prosthetics is performed with solid-cast bridge prostheses.

Prosthetic treatment of the prognathic bite.

The main objectives of orthopedic treatment of the prognathic bite are to eliminate damage to the mucous membrane of the hard palate and the gingival margin of the lower anterior teeth, create a sliding occlusion of the dental arches, reduce the functional overload of the periodontium of the teeth, create support for the anterior teeth, and restore the continuity of the dental arch.

The treatment method for adult patients is determined by the size of the interalveolar distance, the size of the interocclusal space and the height of the lower third of the face, the condition of the periodontium of the teeth, as well as the size and topography of the defect. With the integrity of the dental arches and the normal height of the lower part of the face, two treatment options are possible. Their choice depends on the ability of the lower anterior teeth to move in the vertical direction after their grinding. If there are conditions for their movement, the treatment will be aimed at grinding the teeth in supraocclusion and splinting the anterior teeth. Otherwise, it is possible to limit yourself to grinding the teeth only.

Prosthetic treatment for a decrease in the height of the lower part of the face and intact dental arches consists of increasing the interalveolar height by means of prosthetics with removable dentures with occlusal pads.

Prosthetic treatment of the progenic bite.

Indications for orthopedic treatment of the progenic bite in adults are: mandibular macrognathia when the patient refuses surgical treatment or when there are contraindications to it, and maxillary micrognathia when orthodontic treatment is impossible.

The objectives of orthopedic treatment of the progenic bite are: improving the patient's appearance, normalizing occlusal relationships, eliminating functional overload of the periodontium of the teeth, restoring the continuity of the dentition.

The treatment plan is determined by the magnitude of the sagittal discrepancy of the dental arches, the size and topography of the defects, the condition of the periodontium of the remaining teeth, the size of the lower third of the face and the interalveolar distance. Treatment consists of correcting the occlusion and prosthetics of the defects of the dental arches. In patients with intact dental arches without changing the height of the lower part of the face, prosthetics are carried out primarily to improve the appearance and normalize biting of food. When the height of the lower part of the face decreases as a result of increased tooth wear, it is necessary to restore the interalveolar height. One of the methods is to use a removable denture for the upper jaw with occlusal pads on the lateral teeth and duplication of the front teeth.

SITUATIONAL TASKS

1. Patient O., 25 years old, complains of an aesthetic defect. External examination is without features. Objectively: the oral mucosa is of normal color. The dental arches of the upper and lower jaws are intact. The teeth are stable. Teeth 12 and 22 are in the palatal position (there is less than half the width of the crown missing for them). The crowns of teeth 11 and 21 are wide. The relationship of the first molars is according to Angle's class I. Make a diagnosis. Plan this patient's treatment.

2. Patient F., 27 years old, complains of an aesthetic defect, trauma to the mucous membrane in the area of teeth 12; 11; 21; 22, pain in the TMJ. The nasolabial and chin folds are sharply expressed, the upper teeth lie on the lower lip. The height of the lower part of the face in a state of physiological rest is 66 mm, in the CO position - 60, the angle of the lower jaw on the left and right is 125 °. Examination of the oral cavity revealed: the upper dentition is intact, teeth 36, 35, 46 are missing on the lower jaw. The depth of the incisor overlap is 2/3 the length of the lower incisors. The mucous membrane in the area of the teeth 21; 12 is hyperemic, edematous, and bleeds when touched. The ratio of the first molars is according to Angle's class II. Make a diagnosis and plan this patient's treatment.

3. Patient E., 32 years old, complained of difficulty chewing food. Objectively: Prognathic bite, narrowing of the upper jaw in the lateral sections, protrusion of the upper incisors and distal position of the lower jaw. Teeth 1.6, 4.6 are missing. Make a diagnosis and plan the treatment.

4. Patient K., 24 years old, complains of an aesthetic defect - a diastema between teeth 1.1, 2.1. Objectively: in the area of teeth 1.1, 2.1 there is a pronounced diastema (the distance is 5 mm), micrognathia, progenic bite, all teeth are intact. Make a diagnosis and plan the treatment.

5. Patient M., 25 years old, complains of an aesthetic defect. Objectively: Open bite. Nasolabial folds are smoothed. The mouth is half-open. When the dental arches are closed in central occlusion, a sagittal gap 4 mm wide is visible in the frontal section. Make a preliminary diagnosis, plan the treatment.

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.

3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 30 p.

4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 3

Subject: Orthopedic treatments for pseudoarthrosis, malunion fractures, bone defects, microstomia.

Total class time - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ка	58
6.	Final stage	13

Purpose of the lesson: to teach students methods of prosthetics in case of false joints, incorrectly healed jaw fractures, bone defects, microstomia. To study clinical and laboratory stages of manufacturing prostheses for the treatment of this pathology.

Objectives of the lesson:

1. To study the etiology, clinical features and diagnostics of pseudoarthrosis of the lower jaw.
2. To learn the indications and orthopedic methods of treatment for pseudoarthrosis of the lower jaw, with devices according to Gavrilov, Kurlyandsky, Oksman, and Vanshtein.
3. To review the etiology, clinical features and diagnostics of malunion of the lower jaw, clinical forms of malunion of the lower jaw according to Kurlyandsky.
4. To study the indications and orthopedic methods of treatment of the lower jaw malunion.
5. To study the classification of the lower jaw defects according to Kurlyandsky, methods of fixation of bone fragments of the lower jaw: intra-tissue implants, dental splints, extraoral devices for compression osteosynthesis.
6. To consolidate knowledge on prosthetics for patients with microstomia, types of prostheses.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: control survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from anatomy: the anatomical structure of teeth, dental arches and jaws;
- from histology: the structure of the oral mucosa;

- from general dentistry: new technologies and modern construction materials in the manufacture of partial removable dentures;
- from orthopedic dentistry (fixed prosthetics): partial anodontia, defects of the dental arches, principles of transmitting chewing pressure by various types of dentures.
- from physiology: have knowledge of the function of the TMJ, muscles of the maxillofacial region.

Control questions from related disciplines:

1. Possible complications of jaw fractures. Ways to prevent and eliminate them.
2. Causes of pseudoarthrosis, bone defects, improperly healed fractures, microstomia.

Control questions:

1. Etiology, clinical features and diagnostics of pseudoarthrosis of the lower jaw.
2. Indications and orthopedic methods of treatment for pseudoarthrosis of the lower jaw. Apparatus according to Gavrilov, Kurlyandsky, Oksman, Weinstein.
3. Etiology, clinical features and diagnostics of malunion of the lower jaw. Clinical forms of malunion of the lower jaw according to Kurlyandsky.
4. Indications and orthopedic methods of treatment of the lower jaw malunion.
5. Classification of the lower jaw defects according to Kurlyandsky. Methods of fixation of bone fragments of the lower jaw: intra-tissue implants, dental splints, extraoral devices for compression osteosynthesis.
6. Prosthetics of patients with microstomia. Types of prostheses.

Causes leading to the formation of pseudoarthrosis:

- 1) Reduced compensatory response of the body;
- 2) Low reparative regeneration of bone tissue;
- 3) Violation of the principles of reposition and immobilization of fragments;
- 4) Interposition of soft tissues;
- 5) Bone tissue defect;
- 6) Chronic osteomyelitis.

Scheme of indicative actions on the topic "Orthopedic treatment methods for pseudoarthrosis"

Name of prosthesis	Description, manufacturing method	Indications
Prosthesis according to Oksman	Single-joint prosthesis. A prosthesis with clasp fixation is made using the generally accepted method, and is sawn at the site of the false joint. A rod with a free end in the form of a ball is welded into the larger part, and a box made of a steel sleeve with a lid that slides out on grooves is welded into the smaller part. The box is filled with amalgam and the parts of the prosthesis are connected. The box is closed with a lid, and the prosthesis is installed on the jaw for 15–20 minutes. During this time, the patient actively articulates. As a result, a path is created in the amalgam, which the ball makes, corresponding to the displacement of the jaw fragments during function.	Orthopedic treatment in the presence of absolute contraindications to bone plastic surgery Low mobility of fragments.

	A prosthesis with a two-joint connection. The parts of the prosthesis are connected by a rod with spherical heads of 4–5 mm in diameter at the ends. A prosthesis with clasp fixation is made using the generally accepted method and is sawed at the site of the false joint. On the oral side of the prosthesis, 1–2 mm from the cut, a recess of 7 mm in diameter is drilled in each part. Amalgam and balls are placed in the recess, the holes are closed with prepared sleeves. Then similarly to a prosthesis with a single-joint connection.	Orthopedic treatment in the presence of absolute contraindications to bone plastic surgery. Significant mobility of fragments.
Prosthesis according to Kurlyandsky	Unloading of supporting teeth is achieved by using a ball-and-socket clasp in the prosthesis. The clasp has heads located on the oral and vestibular surface of the tooth crown, smaller in size than the corresponding depressions on the crown. Due to this, the prosthesis is held during all movements of the fragments, leaving the tooth immobile, freeing it from overload.	Orthopedic treatment in the presence of absolute contraindications to bone plastic surgery.
Prosthesis according to Vanstein	The ability to move fragments in all directions is provided by a steel spring connecting two parts of the prosthesis. The prosthesis is fixed to the teeth with clasps and sawn in the area of the defect. Sleeves are welded into the part of the prosthesis, and a steel spring is placed in the gap between them, which acts as a universal hinge.	The same

Classification of bone defects of the lower jaw according to Kurlyandsky:

1. Median defects (single defects of the jaw body):
 - 1) with the presence of teeth on both fragments;
 - 2) with one edentulous fragment;
 - 3) with two edentulous fragments.
2. Unilateral defects (defects of the branch and body of the jaw):
 - 1) bone defect of the jaw branch;
 - 2) bone defect of the jaw angle;
 - 3) absence of one half of the jaw with the preservation of teeth on the remaining fragment;
 - 4) absence of one half of the jaw with the remaining fragment edentulous.
3. Bilateral defects (double defects of the body of the jaw):
 - 1) bilateral defect with the preservation of teeth on all fragments;
 - 2) bilateral defect with one edentulous fragment;
 - 3) bilateral defect with two edentulous fragments;
 - 4) bilateral defect with an edentulous jaw.

Clinical forms of malunion fractures (within the dental arch with teeth on the fragments):

1. Due to a jaw fracture with the formation of a bone defect in the jaw body:
 - 1) with the presence of partial occlusal contact between the antagonist teeth;
 - 2) with the absence of occlusal contact.

2. Due to a jaw fracture without the formation of a bone defect.

The first form is characterized by a shortening of the lower jaw body, the bite, both in shape and size, resembles microgenia with a more or less pronounced false prognathism.

The second form is characterized by occlusion disorders only due to malunion of the fragments. With such malunion fractures, there is no microgenia with false prognathism, but facial asymmetry is observed.

Scheme of indicative actions on the topic: «Manufacturing of a folding prosthesis»

Actions stages	Means required to manufacture apparatuses, sequence of work	Self-control criteria
Examination and diagnosis	Instruments for examination of the oral cavity (dental mirrors, probe, tweezers)	Possibility of inserting a collapsible spoon into the oral cavity
Taking impressions	Plaster, dismountable impression tray, impression material. Each half of the impression tray is filled with plaster, successively inserted into the mouth and installed in its place. After the plaster has hardened, the impression is removed in parts, having first split it. The removed pieces of plaster are assembled, connected with melted wax and the model is cast	Availability of all fragments of the imprint
Casting the model	According to the generally accepted method	
Definition of the central relation	According to the generally accepted method	Free, unconstrained positioning of the jaws according to the size of the occlusal ridge
Modeling of a folding prosthesis	The basis of the future prosthesis is created from wax and artificial teeth are installed. Then the part of the prosthesis with 4 incisors is cut off. The rest of the wax structure is cut into 2 halves, which is necessary for installing the hinge and connecting both parts of the prosthesis with it.	
Replacing wax with plastic	The hinge is installed so that its hinge part is located at the oral edge of the prosthesis, which allows the prosthesis to fold, decreasing in size. Two side parts with tubes are located in the middle of the prosthesis base. Then, at the junction of the halves of the prosthesis, tin foil is installed in the sagittal plane to make the already divided parts of the prosthesis. After replacing the wax with plastic, the prosthesis is ground and polished.	The surface of the prosthesis is smooth without pores, the edges are rounded. The prosthesis is easy to fold. The parts of the prosthesis are immobile.
Making the middle	To make the middle part of the prosthesis, the previously cut side with 4 teeth is	Precise assembly of prosthesis parts

part	installed on the finished prosthesis, having first inserted three pins into it according to the size and position of the hinge tube. The wax is replaced with plastic. Thus, the prosthesis consists of 3 parts, the left and right halves connected by a hinge and the middle part with 3 pins complementing the prosthesis and fastening it into a single whole	
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Scheme of indicative actions on the topic: «Manufacturing of a disassemblable prosthesis»

Actions stages	Means required to manufacture apparatuses, sequence of work	Self-control criteria
Examination and diagnosis	Instruments for examination of the oral cavity (dental mirrors, probe, tweezers)	Possibility of inserting a collapsible spoon into the oral cavity
Taking impressions	Plaster, dismountable impression tray, impression material. Each half of the impression tray is filled with plaster, successively inserted into the mouth and installed in its place. After the plaster has hardened, the impression is removed in parts, having first split it. The removed pieces of plaster are assembled, connected with melted wax and the model is cast	Presence of all fragments of the imprint
Casting the model	According to the generally accepted method	
Definition of central relation	According to the generally accepted method	Free, unconstrained positioning of the jaws according to the size of the occlusal ridge
Modeling of a disassemblable prosthesis	The basis of the future prosthesis is created from wax and artificial teeth are installed. Then the part of the prosthesis with 4 incisors is cut off. The rest of the wax structure is cut into 2 halves so that a ledge is formed	
Replacing wax with plastic	1. One half of the prosthesis is plastered in a flask, the wax is replaced with plastic. After polymerization, they are processed and a ledge of the correct shape is created. They are plastered in an occluder. 2. The second half of the wax prosthesis is connected to the first (made of plastic), the place of connection of the halves of the prosthesis is specified by additional modeling. 3. The second half is plastered in a flask, the wax is replaced with plastic.	The surface of the prosthesis is smooth without pores, the edges are rounded. The prosthesis is easy to fold
Manufacturing the middle part	Both halves of the prosthesis are assembled, three strictly parallel through holes are drilled	Precise assembly of prosthesis parts

	using a parallelometer. A pin is inserted into the holes, connected to the middle part of the prosthesis, and refined by wax modeling. The wax is replaced with plastic.	
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SITUATIONAL TASKS

1. Patient B., 44 years old, complains of narrowing of the oral slit, impaired chewing function, and a cosmetic defect in the area of the corners of the mouth. The anamnesis includes a gunshot wound to the maxillofacial region. Objectively: narrowing of the oral slit up to 3 cm, cicatricial contraction of the muscles in the area of the mouth corners of the mouth. The following teeth are missing on the upper jaw: 18, 17, 16, 15, 14, 13; on the lower jaw: 48, 47, 46, 45, 44, 43, 42, 36. Make a diagnosis; select the best option for orthopedic treatment.

2. Patient A., 29 years old, complains of narrowing of the oral slit, impaired chewing function. The anamnesis includes scleroderma. Objectively: scleroderma lesion (contraction) of the skin in the area of the left cheek, narrowing of the oral slit to 2 cm. The dentition on the upper jaw is intact; teeth 35, 44 are missing on the lower jaw. Make a diagnosis, Choose the orthopedic treatment plan.

3. Patient D., 27 years old, complained of difficulty in opening his mouth. History of long-term intermaxillary traction of fragments of the lower jaw after fractures. Objectively: mouth opening by 4 cm. The dentition on the upper jaw is intact, teeth 36, 35, 44, 46 are missing in the lower jaw. Hyperemia and edema of the mucous membrane in the area of the interdental papillae on the upper and lower jaws are noted. Make a diagnosis, explain the orthopedic treatment plan.

4. Patient K., 69 years old, complains of the lower jaw mobility in an unusual place and difficulty in chewing food. History of the lower jaw fracture and diabetes mellitus. Objectively: 34, 35, 44, 46, 47 are missing, the remaining teeth are stable, percussion is painless, existing fillings are in satisfactory condition. Denture defect class III according to Kennedy of the lower jaw. On the upper jaw, a complete removable plate denture is in satisfactory condition. In the area of missing teeth 46, 47, lower jaw mobility is noted, palpation is painless. The oral mucosa is of physiological color without visible pathology. Name additional research methods, make a diagnosis. Determine a rational method of orthopedic treatment.

5. Patient A., 48 years old, complains of lack of contact between the teeth of the upper and lower jaws on the left; impaired chewing function. History of the lower jaw fracture. Objectively: absence of occlusal-articulatory contacts between the teeth of the upper and lower jaws on the left, the distance between them is 2-3 mm. Deformation of the lower jaw on the left. Fillings and dentures in the oral cavity are in satisfactory condition. The oral mucosa is of physiological color without pronounced pathologies. Conduct additional research methods. Make a diagnosis, choose the best treatment option.

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

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4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 4

Subject: Deformations of dental arches and bite. Etiology, pathogenesis, diagnostics, clinical manifestations. Treatment methods of deformations of dental arches and bite.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ка	58
6.	Final stage	13

Purpose of the lesson: to study the classifications and characteristics of deformations, dental arches and bite and master the methods of their treatment.

Objectives of the lesson:

1. To study the etiology and pathogenesis of dental arch and bite deformations.
2. To study the classifications of deformations according to E.I. Gavrilov and V.A. Ponomareva.
3. To become familiar with the clinical picture of the alveolar dental deformations.
4. To consolidate knowledge on diagnostics of dental arch and bite deformations.
5. To study methods of eliminating occlusal disorders in dental arch deformations.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from anatomy: the anatomical structure of teeth, dental arches and jaws;
- from histology: the structure of the oral mucosa;
- from general dentistry: new technologies and modern construction materials in the manufacture of partial removable dentures;
- from orthopedic dentistry (fixed prosthetics): partial adontoma, defects of the dental arches, principles of transmitting chewing pressure by various types of dentures.
- from physiology: have knowledge of the function of the TMJ, muscles of the maxillofacial region.

Control questions from related disciplines:

1. Anatomy and morphology of the dental system.
2. Timing of eruption of primary and permanent teeth.
3. Bite and its varieties.
4. Etiology and pathogenesis of dental anomalies.

Control questions:

1. Deformations of dental arches and bite. Etiology, pathogenesis.
2. Forms of alveolar elongation according to V.A. Ponomareva.
3. Clinical picture of the alveolar deformities.
4. Diagnostics of dental arches and bite deformities.
5. Methods for eliminating occlusal disorders in dental arches deformities.

When teeth are lost, changes occur in the dentoalveolar system. The teeth deprived of antagonists and the bone surrounding them gradually shift in the direction of the missing antagonists of the opposite jaw.

If the deformation is not prevented by timely dental prosthetics, the displacement of the teeth becomes so pronounced that morphological and functional disorders occur. The displaced teeth create blocking conditions for free movements of the lower jaw, and the greater the degree of displacement, the more severe the blocking conditions. As a result, traumatic articulation of the periodontium of the teeth that are displaced and limit the defect may occur, leading to its diseases, changes in the TMJ occur up to the appearance of arthrosis. In addition, the teeth deprived of antagonists can shift to such an extent that they reach the mucous membrane of the alveolar process of the opposite jaw. All this limits dental prosthetics and makes it impossible to implement it without preliminary preparation for normalization of the occlusal curve of the dental arches.

In 1880, V.O. Popov, in experiments on guinea pigs, demonstrated and described vertical movements of the teeth and deformations of the jaws associated with tooth extraction.

In 1907, G. Godon presented his theory of the articulatory balance. It is based on the integrity of the dental system, which exists stably only with preserved continuity of the dental arches, and when it is disrupted, the teeth shift toward the least resistance. In foreign literature, such deformations are characterized as the Godon phenomenon, and in domestic literature - the Popov-Godon phenomenon.

When the integrity of the dental arch is disrupted, the periodontium of functioning teeth experiences a chewing load that is inadequate in strength, direction and duration of action, which gradually leads to their functional overload. In this regard, it is necessary to distinguish between the types of occlusion.

Occlusion in which the teeth are subject to normal chewing load is called physiological.

Occlusion in which functional overload of the teeth occurs is called traumatic.

A distinction is made between primary and secondary traumatic occlusion.

In primary traumatic occlusion, a chewing load that is inadequate in magnitude, direction and duration falls on the healthy periodontium of the teeth (as a result of the appearance of supercontacts, due to the absence of teeth, irrational prosthetics, etc.).

In secondary traumatic occlusion, normal physiological pressure is placed on the affected periodontium and becomes traumatic. The ability of the periodontium to adapt to an increase in functional load is determined by its compensatory capabilities or reserve forces. Against the background of the affected periodontium, traumatic overload occurs as a result of weakening its endurance. In this case, the normal, and even reduced, occlusal load exceeds the endurance of the periodontium. The pathogenesis of such overload is based on dystrophic changes occurring in the periodontal tissues, which leads to resorption of the bone tissue of the socket walls, and this, in turn, to a violation of the normal ratio of the sizes of the supra- and intraalveolar parts of the tooth. Only those violations of the shape of the dentition that arose as a result of pathology should be called deformations, but only after the masticatory-speech apparatus was formed. Reflected

traumatic node is a periodontal disease that occurs due to articulatory overload of the remaining teeth in these secondary partial anodontia. Reflected traumatic node can manifest itself in three independent forms: 1. Prognathic. 2. Prognathic. 3. Bipognathic. Each form has its own clinical picture and mechanism of development, knowledge of which can be used in the diagnosis, prevention and treatment of the reflected traumatic nodes and periodontal diseases. Partial loss of teeth is the cause of microtrauma of the TMJ and the development of its dysfunctional conditions, post-traumatic arthritis and arthrosis.

Clinic and diagnostics of the dentoalveolar anomalies and deformations in the formed bite.

Clinic of the dentoalveolar deformations depends on a number of factors: time period since tooth loss; patient age; size and topography of the defect; degree of a tooth (teeth) displacement; presence of abrasion of antagonizing teeth; condition of periodontal tissues and the body as a whole.

Classification of deformations of the dental arches (E.I. Gavrilov, 1966) is based on the morphological principle and includes six groups:

- 1) dental arches, the deformation of which occurred due to vertical dentoalveolar elongation of the upper teeth (unilateral and bilateral);
- 2) dental arches, the deformation of which occurred due to vertical dentoalveolar elongation of the lower teeth (unilateral and bilateral);
- 3) dental arches with deformations due to mutual vertical dentoalveolar elongation;
- 4) dental arches with sagittal (medial or distal) displacement of teeth of the upper or lower jaw (unilateral or bilateral);
- 5) dental arches with lingual, palatal or buccal displacement of teeth;
- 6) dental arches, the deformation of which arose due to combined displacement of teeth.

The main pathogenetic mechanism underlying deformations caused by the vertical tooth displacement is alveolar dentoalveolar elongation. The morphological basis for this displacement is alveolar bone hypertrophy. There are two forms of alveolar dentoalveolar elongation (V.A. Ponomareva), which differ from each other in certain morphological and clinical characteristics:

- displacement of teeth together with a hypertrophied alveolar process. The periodontium of the teeth remains clinically unchanged, the clinical crown and root are in normal relationships;
- displacement of teeth together with a hypertrophied alveolar process against the background of periodontal dystrophy in the form of the clinical crown elongation, exposure of the necks, hyperesthesia, and pathological mobility.

The movement of teeth in the sagittal plane can occur in two directions:

- 1) medial - movement toward the midline of the dental arch;
- 2) distal - movement of teeth backwards.

Mesial or distal displacement of teeth can be combined with their rotation around their axis, tilt to the lingual (palatal) side. There are two forms of medial tooth movement:

- 1) body - the tooth moves with the entire body, maintaining a vertical position;
- 2) with tilt - the tooth moves with tilt, since the movement of the crown is ahead of the roots and the tooth becomes at an angle in the horizontal plane.

Secondary deformations of the dental arches can develop against the background of anomalies of the dentoalveolar system. There is a summation of symptoms characteristic of anomalies, partial loss of teeth and deformation. A frequent complication of secondary deformations is the distal displacement of the lower jaw as a result of the loss of lateral teeth and the occurrence of unusual occlusal contacts: deepening of the overlap due to the abrasion of the palatine tubercles; dentoalveolar elongation of the incisors and canines; loss of lateral teeth with deep incisal overlap; lingual inclination of the anterior lower teeth and premolars.

Elimination of occlusal disorders in case of dental arch deformations.

Elimination of occlusal disorders in case of dental arch deformations is an important part of special preparation of the oral cavity for prosthetics and has preventive and therapeutic purposes.

Therapeutic purposes: normalization of occlusal relations, elimination of blockade of movements of the lower jaw, elimination of functional overload of the periodontium of teeth, normalization of TMJ function, creation of conditions for manufacturing a rational design of the prosthesis.

Prophylaxis consists in preventing functional overload of the periodontium of teeth, disorders of the TMJ functions and masticatory muscles.

There are various methods of normalization of occlusal relationships of dental arches.

1. Elimination of occlusal disorders by grinding down the cusps of teeth (V.N. Rallo). The method is indicated for shallow deformations. In case of dentoalveolar elongation, teeth that have lost antagonists have well-preserved cusps, grinding down of which has the following purposes: elimination of blockade of lateral movements of the lower jaw; elimination of traumatogenic occlusion caused by a large external lever.

2. Elimination of occlusal disorders by shortening teeth. The method is indicated for deeper deformations caused by alveolar dentoalveolar elongation, when grinding only the tubercles is not enough. To use this method, preliminary special preparation is necessary - depulping of the teeth that require shortening, followed by covering them with artificial crowns. The amount of tooth shortening is determined on diagnostic models plastered in an articulator.

3. Elimination of occlusal disorders by changing the interalveolar height. Indications for increasing the interalveolar height when eliminating occlusal disorders caused by deformations of the dental arches are shallow deformations with a decrease in the interalveolar distance and a reduced height of the lower third of the face (generalized or localized pathological abrasion of various etiologies). Changing the interalveolar distance in such clinical conditions eliminates occlusal disorders, allows for rational prosthetics, improves the patient's appearance, prevents or eliminates TMJ dysfunction. The method of increasing the interalveolar height is very often combined and is accompanied by grinding down tubercles and shortening teeth.

4. Imposition of special prostheses that cause restructuring of the alveolar process (the orthodontic method). The method is based on creating an increased functional load in the periodontium of the displaced teeth and the bone surrounding them, which leads to restructuring of the bone tissue of the alveolar process of displaced teeth in the opposite direction. The orthodontic method is indicated for the first form of dental alveolar elongation, when the teeth are not affected by caries and have a healthy periodontium. Contraindications to its use are periodontal diseases, pathological mobility, destruction of tooth crowns by caries, the second form of dental alveolar elongation, and old age. This method of eliminating deformation involves the application of a removable or fixed prosthesis with a 1–2 mm separation of the occlusion of the remaining antagonist teeth. The indicator of successful treatment is the disappearance of separation between the natural antagonists.

5. Application of special prostheses that cause the reconstruction of the alveolar process with preliminary compact osteotomy (hardware-surgical method). To reduce the mechanical strength of bone tissue, reduce the time frame and facilitate orthodontic treatment, compact osteotomy is used in combination with hardware treatment.

Surgical (invasive) interventions are considered as an integral part of complex treatment. This is only a preparatory (preliminary) stage for subsequent hardware treatment. There are three main methods of compact osteotomy: 1) linear or band (E.I. Gavrilov); 2) ethmoid (A.T. Titova, A.V. Kozel); 3) combined (E.I. Gavrilov, V.N. Rallo).

Disadvantages of the surgical method of preparing bone tissue for apparatus treatment:

- trauma (accompanied by profound changes in metabolic and trophic processes);
- possibility of postoperative complications;

- possible violation of the integrity of the bone of the anterior or lateral wall of the maxillary sinus during surgery on the upper jaw;
- possibility of opening the bottom of the nasal cavity;
- possibility of thermal burn of the bone;
- possibility of damage to the apices of the roots;
- the possibility of aseptic inflammation turning into purulent;
- contraindications from the general condition of the body.

The compact osteotomy operation can be performed using a high-energy laser (the department's method). This method has a number of advantages over the mechanical method (non-traumatic, no need to peel off the mucoperiosteal flap, almost no inflammatory process).

Thus, the use of the compact osteotomy method weakens the bone tissue and increases its plasticity, which significantly reduces the duration of orthodontic treatment.

To reduce the mechanical strength of bone tissue and increase its plasticity, physical methods and drugs are also used that affect the mineral saturation and strength of the bone (non-invasive methods): focal dosed vacuum, magnetic field, UHF electric field, helium-neon laser, vibration exposure, high- and low-frequency ultrasound, drugs (Trilon B, lithium chloride, sodium acetate), a combination of physical factors and drugs (Trilon B magnetophoresis, Trilon B inductothermoelectrophoresis, lithium chloride ultraphonophoresis, etc.).

6. Extraction of a tooth or teeth and alveolar process (surgical method). This method of eliminating occlusion disorders in case of dental arch deformations is used as a last resort if other previously described methods have proven ineffective or there are contraindications to their use due to the condition of the periodontium of the teeth or the general condition of the body. The method is based on tooth extraction, sometimes with resection of the alveolar process. Indications for tooth extraction as a method of eliminating occlusal disorders are:

- pathological mobility of teeth in case of systemic periodontal diseases (in case of the second form of dentoalveolar elongation), periapical chronic foci of periodontal inflammation (granulomas, cysts, etc.);
- elongation of the clinical crown with root exposure;
- destruction of the tooth crown when it is impossible to restore it;
- severe forms of alveolar dentoalveolar elongation that are not amenable to orthodontic treatment (in cases where shortening the tooth to create a prosthetic space will lead to complete wear of the crown);
- sharp medial inclination of the tooth towards the defect, in which prosthetics are impossible;
- chronic diseases of the cardiovascular system, diseases of the nervous system that do not allow long-term orthodontic treatment;
- advanced age of the patient.

In cases of severe hypertrophy of the alveolar process (in the second form of alveolar dentoalveolar elongation), not only tooth (teeth) extraction is used, but also partial resection of the alveolar process.

7. Prosthetics. Elimination of occlusal disorders in case of dental arch deformations by means of prosthetics is most often carried out in case of the molar medial inclination into the cavity of the defect (in the absence of blocking movements of the lower jaw) and in case of incorrectly fused jaw fragments. The objectives of prosthetics in case of medial inclination of the molar: preventing further medial inclination of the molar, directing chewing pressure along the longitudinal axis of the supporting teeth, creating normal occlusal contacts between the molars of the upper and lower jaws.

Fixed and removable dentures are used:

- bridge denture (in case of a small defect in the dentition);
- dentures in which the distal support is connected to the tilted tooth by a unique articulation in the form of a combined clasp, ring, inlay, telescopic or lock fastening (detachable bridge denture);

- small saddle denture;
 - one-piece clasp denture (if necessary - splinting).
8. Combined treatment.

SITUATIONAL TASKS

1. Patient S., 24 years old, complains of an aesthetic defect and difficulty in biting food. On examination, the patient was found to be practically healthy. Teeth 11, 21, 22 were removed as a result of an injury 30 days ago. The remaining teeth are intact and stable.

Orthognathic bite, the mucous membrane is pale pink. On the X-ray, the canal of tooth 12 is filled with filling material up to the apex of the root. There are no pathological changes in the periapical tissues. Make a diagnosis and suggest a treatment plan.

2. Patient H., 38 years old, came to the clinic with complaints of multiple defects in the dentition. He has not had any prosthetics before. Teeth 17, 15, 14, 11, 25, 26 were lost due to complicated caries. The remaining teeth are intact and stable. Orthognathic bite. Make a diagnosis and suggest a treatment plan.

3. Patient R., 65 years old, complains of difficulty in chewing food due to a broken partial removable plate denture of the upper jaw. He had previously had dentures several times; the last denture was 7 years ago. Tooth 23 is preserved on the upper jaw; teeth 33 and 34 on the lower jaw, the rest are missing. Make a diagnosis and suggest a treatment plan.

4. Patient R., 37 years old, complains of a cosmetic defect, the inability to bite off food. He associates the loss of his front teeth with trauma. Objectively: teeth 11 and 12 are missing, the rest of the teeth are stable and intact. Make a diagnosis and suggest a treatment plan.

5. Patient A., 43 years old, complains of missing chewing teeth on the lower jaw, difficulty in chewing food. Tooth 36 was removed 3 years ago due to complicated caries, tooth 35 has an extensive filling on the distal surface, grade 1 mobility, tooth 37 has been restored with a filling (index of the teeth occlusal surface of destruction = 0.3), the remaining teeth are stable and intact. Make a diagnosis, suggest a treatment plan.

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.
3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 5

Subject: 5. Orthopedic treatment methods for congenital and acquired defects of the palate.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ка	58
6.	Final stage	13

Purpose of the lesson: to study the etiology, pathogenesis, clinical picture, differential diagnostics and classification of congenital and acquired defects of the palate. Master the clinical and laboratory stages of manufacturing protective palatal plates for congenital and acquired defects of the palate; the rules of deontology when treating patients with this pathology.

Objectives of the lesson:

1. To study the etiology and pathogenesis of congenital and acquired defects of the palate.
2. To teach students the general principles of treatment for congenital and acquired defects of the palate.
3. To become familiar with the basic principles of treatment for acquired defects of the palate.
4. To become familiar with the features of medical dispensary observation of patients with congenital and acquired defects of the palate.

Class location - the clinical setting.

Practical skills mastered during the class:

Selection of maxillofacial appliances and prostheses for the treatment of patients with palate defects.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from human anatomy: the anatomical structure of the upper and lower jaws;
- from general dentistry: materials science and laboratory technology for making prostheses;
- from surgical dentistry: tooth extraction operations, indications and contraindications for dental implantation.

Control questions from related disciplines:

1. Development of the dental system.
2. Clinic of gunshot and non-gunshot fractures of the upper jaw.
3. Clinic of specific inflammatory processes in the oral cavity.
4. Complications of fractures of the upper jaw and specific inflammatory processes in the oral cavity.

Control questions:

1. Classification of acquired defects of the palate according to Kurlyandsky.
2. Design features and methods of fixing prostheses for acquired defects of the palate.
3. Etiology, pathogenesis, clinical picture, differential diagnostics of congenital defects of the hard and soft palate. Classification.
4. The role of orthopedic treatment in the complex treatment of defects of the hard and soft palate. Methods of treating congenital defects of the hard palate.

Classification of acquired defects of the palate:

1. Defects of the hard palate in the presence of supporting teeth on both halves of the jaw:
 - 1) median defect of the palate;
 - 2) lateral defect of the palate (communication with the maxillary sinus);
 - 3) frontal defect of the palate.
2. Defects of the hard palate in the presence of supporting teeth on one side of the jaw:
 - 1) median defect of the palate;
 - 2) complete absence of one half of the jaw;
 - 3) absence of most of the jaw with preservation of no more than 1-2 teeth on one side.
3. Defects of the palate in the absence of teeth on the jaw:
 - 1) median defect of the palate;
 - 2) complete absence of the jaw with violation of the edge of the orbit.
4. Defects of the soft palate or hard and soft palate:
 - 1) cicatricial shortening and displacement of the soft palate;
 - 2) defect of the hard and soft palate in the presence of teeth on one half of the jaw;
 - 3) defect of the hard and soft palate in the absence of teeth on the upper jaw.

The tasks of prosthetics for palate defects:

1. Separation of the oral and nasal cavity.
2. Support of soft tissues that have lost bone support.
3. Restoration of speech function.
4. Restoration of chewing and swallowing functions.

Scheme of indicative actions on the topic: « prosthetic treatment methods for defects of the hard and soft palate»

Apparatus name	Description, manufacture technique	Indications, peculiarities
Zbarzh's apparatus	It is a two-sided spacer in the area of chewing teeth to hold the jaws in an open state. In addition, the device has a special platform (a bed for each round stem) and a protective visor for the lower lip. These devices more reliably protect each stem from injury by teeth. In order for the patient to get used to using the device, it should be put on 3-4 days before the operation.	Protective orthopedic device for plastic surgery of the palate with a round stem according to Filatov

Protective palatal plate	Protects the suture line and dressing material from contamination from the oral cavity, immobilizes the palatal flaps in a new position, supports tampons inserted into the incisions, and helps form the palatine vault. It is fixed to the teeth using clasps, restoring the clarity of pronunciation. If there are defects in the dentition, artificial teeth are added to the plate and it is transformed into a denture. Taking an impression: Having selected an impression tray, the palatal convexity of the tray is lengthened at the back so that it reaches almost to the pharynx. For this purpose, a metal plate can be soldered to the back edge of a standard tray. Impression material - thermoplastic masses. It is necessary to obtain clear impressions of all teeth, gums, and edges of the cleft palate up to the back wall of the pharynx. A model is cast. After appropriate processing of the model, a plate is modeled on it. The teeth on the model are engraved at the necks from the vestibular side, due to which the plate is better fixed on the teeth. The model is covered with a slightly heated wax plate 1 mm thick to obtain the shape of the entire dental arch up to the necks of the teeth inclusively from the vestibular side, and orally - up to the end of the model, i.e. up to the pharynx. The wax plate together with the model is plastered in a cuvette, and then a plaster counterform is cast. Having opened the heated cuvette, the wax is removed with a stream of hot water, the cuvette is cooled and a plate is formed from plastic.	It can be used to close a limited defect of the hard palate and eliminate nasal speech. It is necessary for the plate to cover the edge of the defect in the back of the palate and separate the oral cavity from the nasal cavity.
Protective palatal plate according to Urbanskaya and Frigoff	Option 1: An impression tray for the upper jaw is selected according to the size of the jaw, a layer of impression material is applied to the entire surface of the tray and an impression is taken only from the dentition and alveolar process of the upper jaw, without an imprint of the palate and the edges of the palate defect. Thus, there is free space between the palate and the impression. A model is cast according to this impression. The resulting model is lubricated with petroleum jelly and a layer of quick-hardening plastic is applied to it, which is used to press the dentition on both sides and the palatal surface of the model, giving it the shape of the future plate. A few minutes after the plastic has hardened, the plate is removed, processed and adjusted in the oral cavity. Option 2:	The authors recommend making a protective palatal plate from fast-hardening plastic directly at the patient's chair. They offer 2 options for its manufacturing technique.

	For the upper jaw, an individual wax spoon is formed, which should cover all the teeth and the palatal surface of the alveolar process, but should not adjoin the lateral surfaces of the palatal vault. The prepared spoon is cooled and its inner surface is filled with plaster. A protective palatal plate is formed on the resulting model from quick-hardening plastic. After the plastic has polymerized, the plate is removed from the model, cast, polished and adjusted in the oral cavity. If the fixation of the plate in the mouth is insufficient, a small layer of quick-hardening plastic is applied to the inner surface of the plate in the area of the tooth impressions and the plate is again pressed tightly to the teeth. After the plastic has hardened, the plate is processed and finally adjusted in the mouth.	
Protective plastic plate according to Frigoff	The author suggests producing standard palatal plates in 4 sizes. The doctor selects a plate of the required size, adjusts it, then applies a small layer of fast-hardening plastic to its inner surface, inserts it into the oral cavity and presses it against the teeth. After 2-3 minutes, the plastic is carefully removed from the oral cavity. After the plastic has hardened, the fixation of the plate is checked, its contact with the lower jaw teeth is clarified using carbon paper, and it is processed and polished.	The advantage of this method is that it significantly saves time required to make the plate, and most importantly, this method can be used in conditions where there is no dental laboratory.

SITUATIONAL TASKS

1. Patient P., 45, suffering from syphilis, was found to have a defect of the hard and soft palate. Determine the nature of the palate defect, the possibility of orthopedic treatment.
2. A 2-year-old child was found to have a non-fusion of the hard palate, communication with the nasal cavity, difficulty in eating, swallowing, and speaking. Determine the stages of manufacturing an orthopedic device.
3. During a clinical examination, patient K. was found to have a combined defect of the soft and hard palate. What type of prosthesis should be used in this case.
4. Patient T. came to the orthopedic department of the regional dental clinic with the diagnosis: state - after block resection of the upper jaw with removal of teeth 11,12,13,21,22,23. Teeth 16,15,26,27 are missing. Teeth 14,17,18,24,25,28 are intact. Suggest a type of prosthesis and a rational fixation system.

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

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4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

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5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 6

Subject: Orthopedic treatment for jaw resections. Orthopedic treatment for facial defects and injuries.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to teach students in the basics of orthopedic treatment methods for jaw resections, defects, and facial injuries. Provide a description and determine the indications for the use of restorative prostheses at different stages of surgical interventions. Study the clinical and laboratory stages of their fabrication.

Objectives of the lesson:

1. To teach students the general principles of examining patients during treatment for jaw resections
2. To teach students the general principles of orthopedic treatment for defects and facial injuries.
3. To present the main types of restorative prostheses at different stages of surgical interventions.
4. To teach students the clinical and laboratory stages of fabrication restorative prostheses.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: control survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from human anatomy: the anatomical structure of the upper and lower jaws;
- from general dentistry: materials science and laboratory technology for making prostheses.

Control questions from related disciplines:

1. Anatomy of the maxillofacial region.
2. Features of blood supply and innervation of the maxillofacial region.

3. Esthetics of the maxillofacial region.

Control questions:

1. Functional disorders in jaw resection.
2. Immediate, early, remote prosthetics in jaw resection, their features.
3. Method of making an immediate prosthesis in resection of the lower jaw (chin part, half of the lower jaw, the entire lower jaw).
4. Method of immediate prosthetics in resection of the upper jaw (according to Oksman, Kiselev-Pinsky).
5. Prosthetics of patients after resection of the upper and lower jaw in the long term.
6. Defects of the nose, auricle, orbit. Nasal prosthesis. Defects and deformations of the lips and chin. Orthopedic treatment. Forming devices.
7. Craniomaxillofacial prosthetics with support on implants.

Prosthetics after resection of half of the lower jaw

In this case, the jaw prosthesis consists of two parts - fixing and resection. The fixing part with multi-clasp fixation is prepared using a partial impression of the healthy side of the jaw. The supporting teeth are covered with soldered crowns with soldering. First, the crowns are made, then impressions are taken together with the crowns and a plate with supporting and retaining clasps is made according to the resulting model. However, if a patient is to undergo radiation therapy, metal crowns should not be used. In such cases, the prosthesis is fixed with two-link and flip clasps, and the prosthesis is removed during radiation. An inclined plane made of plastic is welded to the fixing plate to eliminate lateral displacement of the remaining part of the jaw. After the fixing plate is fitted, an impression of the lower jaw is taken together with it in the mouth, as well as a cast of the upper jaw. The models are cast and plastered in the articulator in the central occlusion position. The border of the future osteotomy is marked on the model. Stepping back from the osteotomy line, 2 plaster teeth bordering the tumor are cut off at the level of their necks. This is of great importance, since it is necessary that the prosthesis does not interfere with covering the bone cut area with the oral mucosa. The remaining teeth above the tumor are cut off 2–3 mm below the base of the alveolar process. Then they begin modeling the resection part of the prosthesis and setting the teeth. The base behind the dental arch should be somewhat elongated and thickened. The lower edge of the prosthesis should be rounded and concave on the lingual side with sublingual protrusions. Otherwise, the technique for making the prosthesis is no different from the technique for making a removable denture.

In the absence of teeth on the healthy part of the jaw, prosthetics with resection of half of it presents significant difficulties. Fixation of the prosthesis is especially difficult. The prosthetics technique is as follows. An impression of the healthy half of the lower jaw is taken, a model is cast. A plastic plate (the fixing part of the prosthesis) is prepared based on it and adjusted in the oral cavity. Then impressions of both jaws with the fixing plate are taken in the oral cavity. Plaster models are obtained based on the impressions, bite rollers are made, the central occlusion is determined and the models are installed in the articulator. Then a phantom resection of the lower jaw is performed on a plaster model according to the operation plan and the shape and size of the jaw prosthesis are modeled from wax accordingly. Artificial teeth are not installed, but instead only a plastic roller with imprints of the chewing surfaces of the teeth of the upper jaw is left. Fixation of the remaining part of the lower jaw is achieved with the help of the prosthesis and a chin sling. In the first days, an opening equal to the width of 4 incisors is left in the front part of the prosthesis to stretch the tongue if it sinks in and to insert a rubber tube of a drinking cup during meals.

Manufacturing a jaw prosthesis after complete removal of the lower jaw

Before the operation, impressions of the upper and lower jaws are taken. The resulting models are plastered in an articulator in the central relationship position, and the occlusion height is formed. After this, all the teeth are cut off from the lower jaw at the level of the base of the

alveolar process, artificial teeth are placed in occlusion with the teeth of the upper jaw and the base is modeled. If the upper jaw is toothless, the prosthesis is fixed with spiral springs or magnets. Magnets are installed on the prostheses of the upper and lower jaws in the area of chewing teeth on both sides, with the same poles facing each other. When modeling the base, it is necessary to make a bed for the springs in it so that they do not damage the mucous membrane of the cheek.

After modeling the base and setting the teeth, the prosthesis is removed from the model and extended with wax behind the dental arch at the angles of the jaw. The inner surface of the denture should be rounded, but on the lingual side in the area of the chewing teeth it should have a concavity with sublingual protrusions (wings) so that the tongue is positioned above them and this helps to fix the denture. In the area of the canines and premolars, loops are fixed on both sides for intermaxillary fixation, and the group of the front teeth is made in the form of a removable block to eliminate possible retraction of the tongue and the occurrence of asphyxia. A splint made of aluminum wire with hook loops for intermaxillary fixation using rubber rings and rounding of the denture of the lower jaw is applied to the teeth of the upper jaw. 2-3 weeks after the operation and use of the denture, a denture bed is formed in the soft tissues. After this, the rubber ring and hook loops are removed and the denture is fixed with the scars formed around it, and on the lingual side it is held by the tongue. Spiral springs or repulsive magnets also help to fix the denture.

Postoperative prosthesis according to Oksman

The manufacture of the prosthesis for resection of half of the upper jaw is carried out in three stages:

- the first stage is the production of a fixing plate;

- the second stage is the production of the resection part of the prosthesis (in this form the prosthesis is temporary);

- the third is the production of the obturating part of the prosthesis or the transformation of a temporary resection prosthesis into a permanent one.

First, crowns are made with soldering on the supporting teeth, then a partial impression is taken from the healthy part of the upper jaw together with the crowns in the oral cavity and a fixing plate with clasps is made according to the obtained model. After fitting the fixing plate, a full impression of the upper jaw is taken together with the fixing plate in the oral cavity and the resection part of the prosthesis is welded to it according to the obtained models. The models are plastered in the articulator in the central occlusion position. The resection boundary is marked on the upper jaw model, and one tooth on the border with the tumor is cut off at the level of the neck, this is necessary so that the prosthesis does not interfere with covering the resected bone with a flap of the mucous membrane. The remaining teeth are cut off at the level of the base of the alveolar process from the vestibular and palatal side to the middle of the palate, i.e. to the fixing plate. The plate is removed from the model and cuts are made on its palatal surface, as when repairing dentures. The fixing plate is again placed on the model and artificial teeth are installed in occlusion with the teeth of the lower jaw. The edge of the gum of the resection prosthesis is recommended to be modeled with a ridge, which is very important for strengthening the prosthesis, since in the postoperative period, scars are modeled along the ridge, forming a bed. Thus, the base is fixed with the help of a ridge on the prosthesis with soft tissues of the cheek. In this form, the resection prosthesis, as a temporary one, can be used after resection of the upper jaw. Later, as the surgical wound heals, the tampons are removed; the palatal part of the prosthesis is covered with softened impression material to obtain impressions of the edges of the surgical cavity. Then the prosthesis with the impression of the edges of the cavity is plastered in a cuvette, the cuvette is heated and the softened impression material is removed, the vacated space is filled with plastic. When filling the cavity with plastic, first line its bottom and walls, then fill the cavity to the top with wet river sand, and then cover the surface of the sand with a layer of plastic. Thus, the massive part of the resection prosthesis consists of a plastic shell filled with sand inside. After polymerization of the plastic, two holes are drilled in its massive part on opposite sides to the border of the sand and the sand is washed out with a stream of water from the water supply. The passive part of the prosthesis

becomes hollow, and the weight of the prosthesis decreases. The holes are sealed with self-hardening plastic.

The welding of the obturating part of the prosthesis must be done in a short time, since the surgical cavity without the prosthesis quickly shrinks and the prosthesis may become unusable. It is advisable to make two resection prostheses at once, so that when one prosthesis is corrected, the patient can use the second one.

Hollow post-resection prosthesis according to Kiselev-Pinsky

Before the operation, casts are taken from both jaws using any plastic mass. Plaster models are made from the casts. The base of the plaster model of the upper jaw is made as high as it is supposed to resect the upper jaw. Both jaw models are placed in central occlusion and plastered in an articulator, then after a thorough clinical and radiographic examination, the boundaries of the preserved part of the jaw are determined and marked on the plaster model. After this, a resection of part of the plaster model is made within the marked limits, both in the horizontal and vertical planes. Having prepared the model, they begin to make the prostheses.

First, the bottom and medial surface of the resected part of the model are lined with a thin layer of heated wax plate; then the resected part of the jaw is created from plaster of a creamy consistency, only without teeth.

A screw is inserted into the plaster, after which the clasps are prepared and the artificial teeth are installed, and the prosthesis base is modeled. The wax blank together with the model is disconnected from the articulator, plastered in a flask, forming a stamp and a counter stamp. In this case, after the wax has melted, the plaster restored part of the jaw remains fixed on the screw in the counter stamp. Filling the mold with plastic is done sequentially. First, the prepared elastic plastic (AKR-9 can be used) is used to make the bed of the resected part of the jaw, then the prosthesis base is formed from AKR-7 plastic and the artificial teeth are fastened to the base with it. Having created the base and the obturating part of the prosthesis, the flask is placed in the press and after pressing is transferred to the clasp and placed in a bath for polymerization. After polymerization is complete, the prosthesis is removed from the flask, processed and polished. Next, the screw is removed and the plaster is carefully crushed and removed through the hole formed, or the prosthesis is immersed in water for 24 hours to dissolve the plaster. After removing the plaster, the hole in the prosthesis is closed with self-hardening plastic, after which the excess is removed and polished. Subsequently, if there is a discrepancy between the obturating part of the prosthesis and the resected part of the jaw, the obturating part of the prosthesis is covered with self-hardening plastic, which, due to its plasticity, accurately recreates the shape of the jaw defect.

FACIAL DEFECTS

The causes of facial defects are mainly gunshot wounds, burns, surgeries for neoplasms, specific infectious diseases (noma, syphilis). Facial defects can be isolated, for example, of the nose, ear, and combined - with the destruction of several anatomical areas of the face and jaws. This is a special category of patients. Disfigurement of the face causes them severe mental suffering. The main method of treatment is surgical restoration of the face. Orthopedic methods are used as auxiliary ones. Only in certain cases, when there are contraindications to surgical interventions, prosthetics are the only way to eliminate facial defects.

Forming devices

These devices are designed to temporarily maintain the shape of the face, create a rigid support, prevent cicatricial changes in soft tissues and their consequences (displacement of fragments due to contracting forces, deformation of the prosthetic bed, etc.). Forming devices are used before and during restorative surgical interventions.

The design of the devices can be very diverse depending on the area of damage and its anatomical and physiological features. In the design of the forming device, it is possible to distinguish the forming part and fixing devices.

Orthopedic measures in reconstructive operations of the nose

Plastic operations for incomplete or complete defects of the nose always end with the application of a forming bandage. Rubber tubes wrapped in iodoform gauze are inserted into the nasal passages, and dense gauze rolls are placed on the lateral slopes of the nose on both sides. All this is secured with strips of adhesive tape.

This problem can be solved more rationally with the help of orthopedic devices, which are individually made devices for forming the nasal cavity and airways, as well as the external contours of the nose. An example of such a forming device is the design proposed by Z. Ya. Shur. It consists of a soldered crown splint fixed on the upper teeth, a removable arch with extraoral rods and a forming device. The latter includes a frame in the form of a hollow plastic pyramid open to the defect, and a pelot, which consists of two halves connected with a wire. The frame serves to form the inner surface of the nose, and the pads serve to form its outer contours.

Nose prosthesis

In rare cases, when there are no possibilities for surgical restoration of the nose, or at the stage of waiting for the operation, a method of prosthetics is used, which includes modeling, selection of material, creation of fixing devices, laboratory production, fitting of the prosthesis in relation to the tissues limiting the nasal defect.

Modeling of an artificial nose is carried out on a face mask made of clay or wax. To make an accurate mask (model) of the face, the cast should be removed with an elastic mass, strengthening it from the outside with plaster directly on the patient's face. In this case, it is necessary to use existing photographs of the patient's face before the injury. The configuration of the profile of the external nose can be constructed on a lateral teleroentgenogram of the head, using mathematical methods (M.Z. Mirgazizov).

Elastic and hard plastics are used as a structural material. The latter have certain advantages: they transmit light, easily take the desired shape and color. To strengthen the nasal prosthesis, the retention properties of the defect itself and mechanical devices are taken into account: spectacle frame, springs and connecting devices.

The inner surface of the prosthesis contains longitudinal and transverse elastic processes in accordance with the retention depressions and niches existing or created surgically in the area of the defect. A fixing device is mounted at the root of the artificial nose for connection with the spectacle frame.

If the nasal defect is combined with a defect of the upper jaw and palate, the artificial nose is fixed to the jaw prosthesis. With this method of fixation, mutual strengthening of the prostheses occurs, which significantly improves their stability during function.

When fitting the prosthesis, special attention should be paid to the boundaries of its adhesion to the surface of the face. It is necessary to achieve a tight, barely noticeable transition of the prosthesis boundaries to the skin of the face and their stability during contraction of the facial muscles.

Ear prosthesis

Congenital and acquired ear defects are usually corrected surgically.

There is a possibility of ear prosthetics. The artificial ear is made of elastic plastic. It is modeled according to the shape of the opposite auricle. It is strengthened with springs and the retention properties of the external auditory canal are used. If these strengthening methods are insufficient, then clips are created from a microstem in the mastoid process area.

Orbital defect prosthetics

In case of destruction or surgical removal of the eyeball, it is replaced with an artificial eye. Eye prosthetics are performed as part of ophthalmological care. The need for the participation of orthopedic dentists arises in case of combined damage to the upper jaw and the orbital area.

In case of orbital defects, the eye prosthesis is connected to the orbital prosthesis. A spectacle frame is used to additionally strengthen the prosthesis.

In case of combined defects, the design of the prosthesis can be quite complex, since it is designed to simultaneously replace lost teeth, alveolar process, jaw body, palate, orbit and eye. Accordingly, the prosthesis can be divided into dental, jaw, facial and eye parts.

Such a complex, multifunctional prosthesis can be disassembled. The eye part of the prosthesis is connected to the maxillofacial part using hinges.

Craniomaxillofacial prosthetics with support on implants

Fixation of prostheses of the nose, eye, auricle was traditionally carried out by means of mechanical retention and the use of adhesives, which did not always provide a sufficient level of retention. Endosteal implants have proven to be extremely useful for fixation of prostheses replacing defects of the bones of the facial skull and the soft tissues covering them (exoprostheses, epitheses). Osseointegration of titanium implants can successfully occur in the bone tissue of any bone of the skeleton, which was proven by the founder of implantation P.I. Branemark (1969). This method makes it possible to replace acquired and congenital defects of the face that cannot be eliminated using maxillofacial surgery (exoprostheses of the nose, eye, auricle, etc.). The number and size of titanium implants, the method of fixation of the prosthesis are selected individually based on the clinical situation. The retention force of such prostheses should generally exceed their weight, i.e. the force of gravity. Since even with sharp movements of the head and neck the prostheses do not experience loads comparable to those that occur during chewing, fewer implants are required to fix the prostheses. Magnets can be used for fixation.

Implants used to fix auricular prostheses are inserted into the bone tissue of the temporal bone. The presence of hair in this area makes it difficult to use adhesives. Locking of prostheses on implants is more aesthetically pleasing. A special feature is the need to maintain the proper level of hygiene around the implants to prevent skin irritation. Implants can also be used to fix parts of hearing aids.

Eye prostheses are fixed with adhesives. The need to use implants arises when the resection area is expanded. Implants are inserted into the upper or lateral edge of the orbit, since the bone in the medial areas does not have the density required for implantation. To fix the nasal prosthesis, implants are inserted into the upper part of the upper jaw body from the nasal cavity. As a rule, the bone tissue of the frontal bone is not dense enough for implantation in this area, and the nasal prosthesis is fixed with implants only from below. For reliable fixation of the exoprosthesis, a beam system with vertical processes extending from the beam is often used.

Defects and deformations of the lips and chin area

Defects and deformations of the lips and soft tissues of the perioral area can be isolated or combined with damage to the jaw bones. The most common combination is defects of the lower lip and chin area of the lower jaw.

Orthopedic measures are auxiliary in this case. They are mainly indicated in cases of a combination of soft tissue damage with the absence of front teeth, with defects of the alveolar process and the body of the jaw, when the lips and cheeks lose support. However, in some cases, it is necessary to use forming devices in the presence of all teeth, for example, in the surgical elimination of cicatricial changes in the transitional fold.

In plastic restoration of the lips from skin-muscle flaps of the perioral area or from the Filatov stem, the use of forming devices is included in the treatment plan. Their main purpose is to create support for the plastic material - a flap, prevent its deformation, and eliminate salivation from the mouth in case of lip defects combined with a defect of the body of the lower jaw in the chin area. These problems can be solved with the help of dental, jaw prostheses and special forming devices.

The choice of the design of the orthopedic device, prosthesis depends on the nature of the defect, the plan of the upcoming surgical intervention and the conditions for strengthening the device: the presence of teeth, their condition, the presence of a bone tissue defect, etc.

In case of cicatricial changes in the transitional fold and vestibule of the mouth, the task of surgical treatment is to improve the mobility of the lips, cheeks by excising scars and transplanting skin and mucous flaps. The tasks of orthopedic intervention are: creating support and holding the transplanted material, preventing its wrinkling and deformation. To solve these problems with intact dentition, forming devices with tooth fixation can be used. The simplest device is a dental aluminum wire splint with a process and loops for holding the thermoplastic mass in the wound area. Such a design can be created on the basis of a wire arch soldered to artificial crowns or a mouth guard, which are fixed on the front teeth of the lower jaw.

In the absence of front teeth, a removable denture is used as a forming device, the base of which in the area adjacent to the surgical field is used to hold the plastic material. Subsequently, the prosthesis continues to have a prophylactic effect as a means of preventing the formation of postoperative scars.

The tasks and methods of orthopedic treatment for lip defects without a bone tissue defect differ little from the situation described above. When a lip defect is combined with a defect in the chin area, the tasks of surgical treatment are plastic restoration of their integrity, normalization of food intake, restoration of speech function, and elimination of facial disfigurement. The tasks of orthopedic intervention include a number of measures to provide the patient with a feeding device, manufacture of a saliva collector, temporary retention of fragments in the correct position, replacement of the bone defect and, finally, creation of support for the formation of soft tissues. Consistent solution of the listed tasks contributes to a favorable outcome of treatment.

A sippy cup, gastric tube and special devices are used to feed patients with maxillofacial injuries. B.K. Kostur suggests a simple device that allows feeding a nutrient mixture under pressure through a tube into the oral cavity, directly into the esophagus or stomach, depending on the nature of the pathological process. The device consists of a standard glass jar with a capacity of 0.5 or 1 l, which is closed with a metal lid equipped with a rubber cuff. Tight fixation of the lid on the jar is achieved with a metal clamp and a screw. To allow air to enter the jar, there is a 1 mm diameter nipple on the lid, and to exit the nutrient mixture, there is a 6 mm diameter nipple, into which a 6-12 cm long rubber tube is put on, depending on the size of the jar. Air is pumped into the jar using a rubber bulb, and the nutrient mixture is fed from the jar into the oral cavity, esophagus and stomach through a gastric tube, the free end of which is put on the corresponding nipple. The patient can use such a device without outside help.

In case of gaping facial defects, it is necessary to take measures in connection with salivation before the lower lip is restored. To prevent saliva from getting on the skin of the face, neck and underwear, a saliva collector is made. The missing part of the chin area is modeled from a plate of softened wax - a kind of chin sling. A connecting pipe (nipple) is installed in the center of the sling, and hook loops are installed on the sides. Then the wax is replaced with plastic. The finished saliva collector is placed on the damaged area, secured with a rubber strip on the patient's head. A rubber tube is put on the nipple, the other end of which is connected to a small bottle. As saliva accumulates, the bottle is emptied.

The choice of the design of the forming device depends on the presence of teeth on the lateral fragments. If there are a sufficient number of stable teeth, a maxillofacial prosthesis can be designed, which serves not only as a forming device, but also replaces the bone defect. Due to the large volume of the prosthesis, it is made collapsible. Such a design is easy to remove and insert into the oral cavity after plastic surgery of the lower lip.

If there are no conditions for strengthening the prosthesis on the remaining teeth of the lower jaw, a forming device is used, which is fixed on the upper teeth (A. I. Betelman). Such a device consists of two parts: a non-removable - fixing and a removable - forming one. Both parts are connected to each other by means of rods, pins and tubes.

The use of forming prostheses and devices, despite their complexity, is necessary, since plastic surgery on the lip and soft tissues of the perioral area without orthopedic assistance practically does not give a favorable outcome.

SITUATIONAL TASKS

1. A dental hospital is preparing to operate on a patient for a tumor of the lower jaw in the chin area. List the possible orthopedic measures.

2. After resection of half of the edentulous jaw (the lower), the patient has difficulty fixing the maxillofacial prosthesis on the remaining healthy side. Explain the features of maxillofacial prosthetics in this case.

3. A patient with a complete absence of teeth underwent surgery for a tumor - half of the lower jaw was resected. Justify the maxillofacial orthopedic treatment plan.

4. A patient with a tumor in the area of the right side of the lower jaw was admitted to the dental hospital. The dentition of the upper jaw is intact. The remaining teeth on the lower jaw 31, 32, 33, 36, 37 are intact, percussion is painless. Justify the treatment plan and explain the stages of manufacturing a resection prosthesis.

5. In the maxillofacial surgery clinic, an operation was performed on a neoplasm - resection of the right half of the upper jaw. Objectively, the dental formula:

4	4	4	4	4	4	4	4	0	0	0	7	7	4	4	7	4
<u>18</u>	<u>17</u>	<u>16</u>	<u>15</u>	<u>14</u>	<u>13</u>	<u>12</u>	<u>11</u>		<u>21</u>	<u>22</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	<u>28</u>
48	47	46	45	44	43	42	41		31	32	33	34	35	36	37	38
4	7	4	4	7	7	0	0		0	0	0	0	7	4	7	4

Determine the tactics of patient management in the orthopedic dentistry clinic.

6. Patient V., 46 years old, was admitted with a diagnosis of sarcoma of the upper jaw. Partial resection of the upper jaw is planned. Make an orthopedic treatment plan.

7. Patient L., 57 years old, came to the clinic with significant cicatricial changes in the face, total absence of the nose and right ear. Make an orthopedic treatment plan.

8. Patient A., 43 years old, was admitted with a diagnosis of ameloblastoma localized in the lower jaw on the left. Resection of the lower jaw is planned, followed by bone grafting. Make an orthopedic treatment plan.

9. Patient P., 40 years old, came with complaints of a combined defect of the lower lip and alveolar process of the lower jaw in the frontal area, absence of teeth 32,31,41,42,43. What is the main purpose of the orthopedic device in this case?

10. When removing the patient's face mask, a hematoma of the nasal dorsum was detected. What mistake was made when removing the plaster structure?

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.
3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 7

Subject: Dental implants. Characteristics. Indications and contraindications.
Main types of dental implants.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to teach students to apply various methods of patient examination when planning treatment using dental implants, to teach how to determine indications and contraindications for implantation. To familiarize students with the types of dental implants.

Objectives of the lesson:

1. To teach students the general principles of examining patients during treatment using dental implants.
2. To teach students the general principles of planning orthopedic treatment using dental implants.
3. To present the main types of dental implants used in medical practice to restore the integrity of the dentition.
4. To familiarize students with the indications and contraindications for the use of prostheses supported by dental implants.

Class location - the clinical setting.

Practical skills mastered during the class:

Planning orthopedic treatment of patients with anodontia with fixed dental prosthesis structures supported by dental implants using cone-beam computed tomography.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3.

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from human anatomy: the anatomical structure of the upper and lower jaws in terms of age and after tooth extraction;
- from general dentistry: materials science and laboratory technology for making prostheses;
- from radiation diagnostics: methods of X-ray examination of the dentoalveolar system.

Control questions from related disciplines:

1. Anatomy of the maxillofacial region.
2. Features of blood supply and innervation of the maxillofacial region.
3. Materials used for implantation, requirements for them.

Control questions:

1. Examination of patients and diagnosis with partial and complete adontoma during prosthetics using implants.
2. Types of bone tissue according to S. Mish.
3. Types of dental implants, their characteristics. (classification, types of implants).
4. Structural elements of dental implants.
5. Indications and contraindications for prosthetics using dental implants.
6. Requirements for prostheses used after dental implantation.

The use of intraosseous implants opens up wide possibilities for restoring the integrity of dental arches, and also serves as one of the effective ways to prevent jaw atrophy and secondary deformations of the dental system. Over the past decade, dental implantology has rapidly developed as a separate discipline, which has opened up new opportunities for restorative dentistry, in particular, the boundaries in improving the quality of eliminating dental arch defects have expanded. Orthopedic structures on osseointegrated implants are most capable of providing normal chewing function, anatomical, physiological, professional and social comfort to the patient, and giving self-confidence. The procedure for restoring the integrity of dental arches using implants involves solving the problem of their individual selection for each patient, taking into account the conditions of their functioning in the future in the bone tissue-implant-orthopedic structure system. These conditions determine the choice of specific morphometric characteristics of the implants, including their diameter, length, as well as the parameters of the macro- and microrelief. However, in some cases, conditions such as insufficient bone volume and/or its low density complicate the process of recreating an adequate anatomical relationship of the oral cavity structures. In this regard, today, two trends are clearly visible in the development of patient treatment tactics by installing dental implants:

1) local increase in bone density and/or restoration of its volume using alternative methods of forming an implant bone bed.

2) in the presence of low bone density and/or deformation — change in the dimensional parameters of the implant and selection of its macrorelief.

S. Mish (1990) proposed a detailed clinically oriented classification of the quality of jaw bones indicating the volume and density of bone tissue, as well as the advantages and potential problems of performing dental implantation.

Type D1 — thick compact bone, average bone density on the Hounsfield scale of more than 1250 units (anterior section of the atrophied edentulous lower jaw) provides good initial stability of the implant and a large area of contact with bone structures, but creates difficulty in preparing the implant bed and increases the time of reparative regeneration due to poor blood supply.

Type D2 - thick bone with uniform compact and spongy substance, average bone density according to Hounsfield from 850 to 1250 units (alveolar part of the lower jaw) is ideal conditions for dental implantation.

Type D3 - thin bone with porous compact plate and loose spongy substance, average bone density according to Hounsfield from 350 to 850 units (alveolar process of the upper jaw, good condition after bone grafting) is associated with good blood supply, but the area of contact with mineralized structures is reduced, therefore it is necessary to increase the number of implants and use the method of bone compaction when forming the receiving bed.

Type D4 – thin compact substance and a layer of very loose spongy bone, average bone density according to Hounsfield less than 350 units (maxillary tuberosity, satisfactory situation after bone grafting) is considered the most difficult option for installing dental implants. A convenient rule for the diagnostic stage in dental implantology is segment-by-segment registration of diagnostic parameters and planned treatment (Mirgazizov M.Z., 2003, Ivanov S.Yu. et al., 2003). In this case, for the jaw segment of each missing tooth, the following are recorded: bone type, parameters of the possible implant immersion depth and its width (diameter), as well as the recommended dental prosthetic design. In addition, the need for reconstruction of the jaw bone tissue may be indicated.

Dynamics of formation of osseointegrated contact

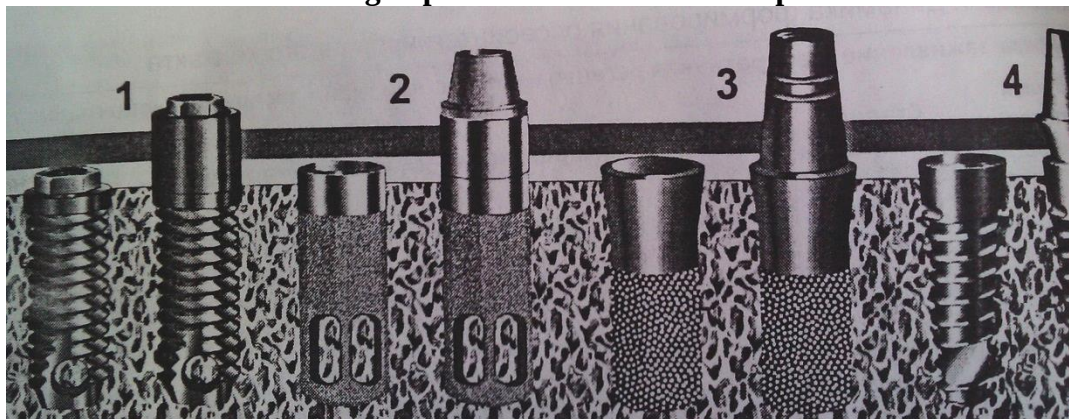
Table 1

I phase: healing (reparative regeneration) of the bone tissue of the receiving bed		
Time after the operation	Regeneration stage	Morphological characteristics
0–12 hours	Primary tissue response	Hemorrhage, formation of blood clots in the bone marrow spaces and in the necrotic zone of the receiving bed, adhesion of blood cells and plasma proteins (fibronectin and vitronectin) on the surface of the implant
12–48 hours	Acute inflammation	Migration of polymorphonuclear leukocytes and macrophages. Formation of granulations in bone marrow spaces and partially in the necrosis zone
2–5 hours	Initiation of primary osteogenesis	Beginning of capillary and osteogenic cell proliferation on the periosteal and endosteal surfaces of bone tissue adjacent to the implant. Differentiation of osteogenic cells into osteoblasts begins in areas where capillary proliferation is intense and blood circulation is restored. In areas where blood supply is insufficient, osteogenic cells differentiate into chondro- and fibroblasts
1–3 weeks	Initiation of secondary osteogenesis	Osteons and trabeculae in the necrosis zone undergo osteoclastic resorption. Osteoblasts formed on the endo- and periosteal surfaces of the bone synthesize collagen and connect with their processes to osteocytes of viable areas of trabeculae and osteons
3–6 weeks	Osteoid formation	On the endo- and subperiosteal surfaces, the synthesis of the organic matrix of the bone by osteoblasts is completed and its mineralization begins. At the site of resorbed osteons, osteoblasts begin to synthesize collagen
6–8 weeks	Completion of reparative regeneration	Osteons and trabeculae of the necrotic zone damaged during the operation are replaced by partially mineralized coarse fibrous bone tissue. The bone healing process is complete.
II phase: structural reorganization (functional regeneration) of bone		
Time since the function onset	Regeneration stage	Morphological and functional characteristics

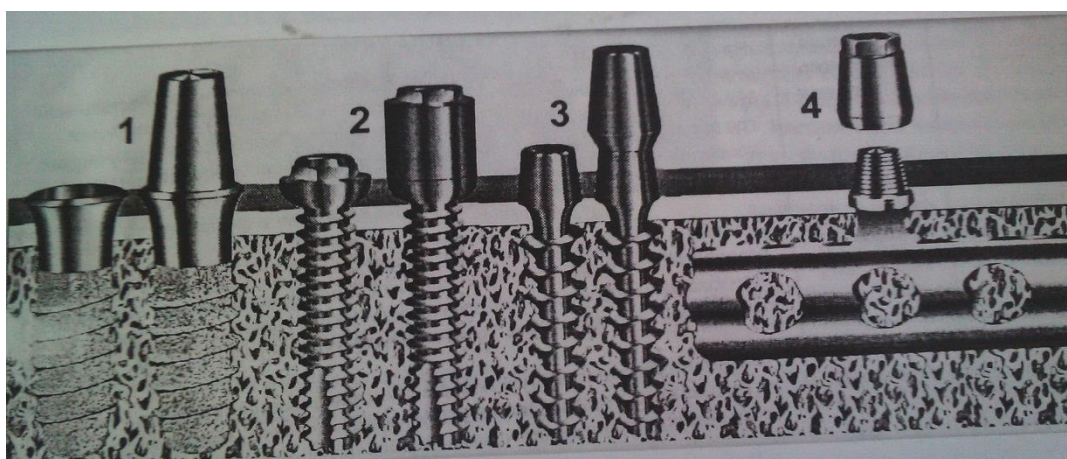
1–2 weeks	Initiation of the structural restructuring	Under the influence of functional load, due to piezoelectric and electrokinetic effects on the surface of individual structural elements of the bone interacting with the implant, osteoclastic resorption of those areas of osteons and trabeculae that are represented by coarse fibrous bone tissue is activated.
2–12 weeks	Formation of lamellar bone tissue	In the resorbed areas, osteoblasts synthesize collagen fibers that are oriented in accordance with the load vector and are arranged in parallel rows. Following the synthesis of collagen fibers, mineralization of the organic matrix occurs
3–18 months	Modification of the bone architecture	In place of the resorbed coarse fibrous bone tissue, lamellar bone tissue is formed, which is adapted to the functional load. The process of formation of lamellar bone tissue is accompanied by reorientation of trabeculae and an increase in their volume
Up to 25 years	Stabilization of osteogenesis and osseointegration	After the formation of the mature bone tissue, a resting phase of osteogenesis occurs lasting up to 25 years. This condition is observed in cases where the magnitude of the load and the nature of the function do not change, and the hormones responsible for mineral metabolism control and maintain calcium homeostasis

Currently, a dentist has a significant number of different implant options with very different characteristics. It is important to pay attention to the shape of the implant body, since different shapes are recommended for installation in bone tissue of different densities. Today, the most common body shapes of screw endosseous implants are cylindrical, which is recommended for installation in dense bone - D1-D2; root-shaped, recommended for installation in bone tissue of the D2-D4 format, and conical - for installation in bone type D3-D4. In addition, there is a relationship between the surface area of the implant and the features of the shape of its body. Thus, the maximum surface area is characteristic of the cylindrical shape of the implant body, a smaller one - for the root-shaped one, and, finally, the minimum - for the conical one.

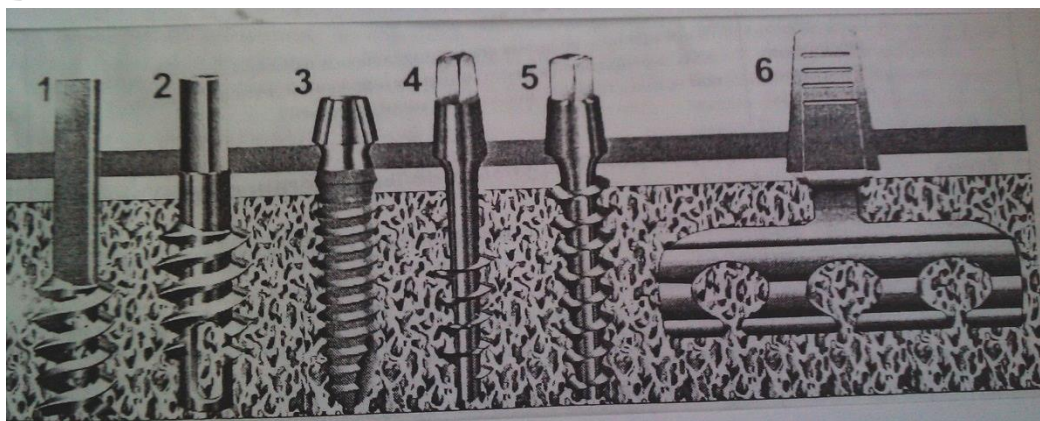
Design options for intraosseous implants



A



B



C

A - two-stage implants:

- 1 – one of the most widespread in the world screw implant Branemark;
- 2 – cylindrical implant IMZ with a shock-absorbing system, developed by A. Kirsch in 1980;
- 3 – one of the first domestic two-stage implants – Smirnov implant with a porous intraosseous part;
- 4 – conical screw implant of the "Radix" system.

B - disassemblable one-stage implants:

- 1 – Bonefit system implant with plasma-sprayed textured surface of the intraosseous part;
- 2 – The latest version of Branemark implants with an intraosseous part diameter of 2.5 mm;
- 3 – Radix – DM implant with an intraosseous part diameter of 2.8 mm;
- 4 – Radix-BL disassemblable plate implant

C – non-separable implants:

- 1 – one of the first intraosseous implants – Chercheve implant;
- 2 – screw implant, invented in 1962 by L. Linkov;
- 3 – implants textured by plasma spraying;
- 4 – “gimlet” type implant, developed by Tramonte in 1964;
- 5 – Radix – I implant with triangular anti-rotation protection;
- 6 – classic plate implant by L. Linkov.

Indications and contraindications for dental implantation

- Indications** for dental implantation are clinical variants of secondary anodontia:
- Absence of one of the teeth in the frontal section;

- Limited included defects of the dentition;
- Terminal unilateral and bilateral defects of the dentition;
- Complete absence of teeth, especially with a decrease in the height of the alveolar processes;
- Intolerance to removable dentures due to increased sensitivity to acrylates or with a pronounced gag reflex;
- Absence of functional occlusion and, as a consequence, the occurrence of pain syndrome of TMJ dysfunction.

In the process of collecting anamnesis, identifying patient complaints and examining the oral cavity, absolute and relative contraindications for dental implantation are determined.

Absolute contraindications:

- Diseases of the blood and hematopoietic organs;
- Diseases of the central nervous system (congenital and acquired);
- Malignant neoplasms of organs and systems in the patient;
- Immunopathological conditions;
- Systemic diseases of connective tissue;
- Tuberculosis;
- Diseases of the oral mucosa (chronic recurrent aphthous stomatitis, lupus erythematosus, pemphigus, Sjogren's syndrome, etc.);
- Bruxism, hypertonicity of the masticatory muscles;
- Type 1 diabetes.

Relative contraindications:

- Poor oral hygiene and poor oral hygiene;
- Gingivitis of various etiologies;
- Marginal periodontitis;
- Malocclusion;
- Arthrosis of the temporomandibular joints;
- Severe atrophy or defect of the alveolar bone tissue;
- Bad habits;
- Pregnancy.

SITUATIONAL TASKS

1. Patient K., 16 years old, complains of a gum injury in the area of the extracted tooth 16. The tooth was extracted 5 years ago. The remaining teeth of the upper and lower jaws are intact. What type of orthopedic structure is most acceptable in this situation?

2. Patient A., 27 years old, complains of an aesthetic defect. Examination of the oral cavity revealed the absence of tooth 12 (extracted due to chronic granulating periodontitis), the remaining teeth are intact, the bite is orthognathic. History: diabetes mellitus, persistent bruxism. Suggest an orthopedic treatment plan to eliminate this defect of the dentition.

3. Patient V., 35 years old, sought prosthetics with implants in the area of the missing tooth 45. The tooth was extracted a year ago. What diagnostic methods should be prescribed and what specialists' consultations are necessary.

4. Patient R. underwent implantation in the area of missing teeth 15, 16 with subsequent production of crowns from MK. Within what time after prosthetics is the functional state of the implants assessed?

5. Patient P., 55 years old, complains of pain in the temporomandibular joint on the right. Palpation of the TMJ revealed pain on the right. Palpation of the masticatory muscles reveals pain in m.masseter, d, m.temporalis, d, m.pterygoideus lateralis.s,. Examination of the oral cavity revealed the absence of teeth 35, 36, 37, 45,46,47. Orthognathic bite. Diagnosis: TMJ arthrosis, partial secondary adentia of the lower jaw (class I according to Kennedy). Suggest a rational orthopedic treatment plan.

LITERATURE

Basic:

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Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.
3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 8

Subject: Features of prosthetics using dental implants in the manufacture of fixed dentures.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to teach students to apply various methods of treating patients with fixed prostheses using dental implants, to teach how to determine indications and contraindications according to clinical protocols for various types of fixed structures and dental implants. To familiarize students with the types of dental implants for fixed prostheses.

Objectives of the lesson:

1. To teach students the general principles of treating patients with partial and complete adontoma with fixed structures using dental implants.
2. To familiarize students with the indications and contraindications for the use of fixed prostheses supported by dental implants.
3. To present the main types of dental implants for fixed prosthetics used in medical practice to restore the integrity of the dentition.
4. To familiarize students with the clinical and laboratory stages of manufacturing fixed structures supported by dental implants.
5. To teach students to identify errors and complications in prosthetics with fixed structures using dental implants.

Class location - the clinical setting.

Practical skills mastered during the class:

Planning orthopedic treatment of patients with anodontia with fixed dental prosthesis structures supported by dental implants using cone-beam computed tomography.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from human anatomy: the anatomical structure of the upper and lower jaws in terms of age and after tooth extraction;

- from general dentistry: materials science and laboratory technology for making prostheses;
- from radiation diagnostics: methods of X-ray examination of the dentoalveolar system.

Control questions from related disciplines:

1. Anatomy of the maxillofacial region.
2. Features of blood supply and innervation of the maxillofacial region.
3. Materials used for implantation. Requirements for them.

Control questions:

1. Indications and contraindications for the use of fixed dentures supported by dental implants.
2. Types of dental implants used as support for prosthetics with fixed structures, their characteristics. (classification, types and structural elements of dental implants).
3. Clinical stages of manufacturing fixed structures supported by dental implants.
4. Laboratory stages of manufacturing fixed structures supported by implants.
5. Errors and complications in prosthetics with fixed structures using dental implants.

Clinical and laboratory stages of manufacturing permanent dental prostheses supported by implants

Clinical stages	Laboratory stages
Taking preliminary (anatomical) impressions from both jaws, casting models	
	Making a custom tray to obtain a working impression
Fitting the tray, obtaining a working (functional) impression, determining the central occlusion	
	Casting the working model, fixing the models in the articulator
	Selection and milling of abutments
	Modeling of the prosthesis frame
	Casting, processing of the frame, fitting of the frame on the model
Fitting the frame in the clinic, choosing the color of the lining	
	Application of the cladding
Fitting of a prosthesis in the clinic	

There are several ways to obtain impressions and make working models. If non-separable implants were used and their heads were individually adjusted in the oral cavity by means of preparation, it is necessary to obtain a traditional two-layer impression followed by casting a conventional disassemblable model, where the implant head is depicted in plaster.

However, prosthetics on dental implants requires higher standards of accuracy. The most advanced technology for manufacturing dental prostheses is the use of disassemblable implant systems with additional orthopedic components and obtaining a non-cut plaster model.

Additional orthopedic elements of the implant structure include an impression module and a laboratory analogue of the implant, as well as a modeling cap. Each implant system assumes its own original components that precisely match each other. Many system manufacturers provide a multi-type approach, when different types of implants with the same orthopedic elements are installed for prosthetics in the same patient. An example is the “multi-implant” concept of the

Oraltronics company, which combines dismountable and non-dismountable screw and plate implants with a large number of different, mutually articulated head options. Impression modules are fixed in the intraosseous part of the implant immediately before applying the tray with the impression mass. The closed "conventional" method of obtaining an impression involves the use of impression modules, the dimensions of which approximately correspond to the dimensions of the teeth. After removing the closed impression from the oral cavity, the impression module remains on the implant, then it is unscrewed and an analogue of the implant is attached to it and inserted into the impression. Closed impressions are usually obtained with two-layer masses: first, the base layer is used, and then the corrective one. It is often used with a small number of supporting units of the prosthesis, parallel to each other and with minimal deviations from parallelism (the deviation angle should not exceed 10 degrees). They are most acceptable in use when both implants and teeth serve as supports for the prosthesis. The open method of obtaining impressions is carried out using plastic trays and large-sized impression modules, according to the location of which a hole is cut in the tray. When applying the impression tray, the outer edge of the impression modules passes through it. After the impression material has hardened, the fixing screw of the impression modules is unscrewed, and the impression is removed from the oral cavity together with the impression modules, to which the implant analogues are then attached.

This type of impression is obtained by simultaneously introducing two masses of different consistencies, with the less fluid mass placed on the tray, and the more fluid one introduced into the implant area - "sandwich technique". Another option is to use a special material for single-layer impressions "Impregum".

The method of obtaining open impressions is mandatory when multiple implants are used, when it is impossible and impractical to ensure their parallelism. After receiving the impression, the area of the implant location, overlapping the border of the impression module and the implant analogue, is filled with a special material - a gingival mask (for example, "Gi-mask"). This mass is easily separated from the plaster, which allows convenient and accurate dental work on the implant.

Determination of the central occlusion and the central ratio of the jaws is performed in the usual ways. In complex clinical cases, these procedures should be carried out using a face bow and individual adjustment of the articulator parameters.

The process of constructing a dental prosthesis is largely determined by the method of its fixation to the implant. Fundamentally, there are two types of fixation:

A fixed orthopedic structure, which is fixed to the heads of the implants by means of cementation.

A fixed orthopedic structure, which is fixed to the heads of the implants by means of a screw connection.

SITUATIONAL TASKS

1. Patient T., 50 years old, complains of mobility of the orthopedic structure made on implants. Upon examination, microgaps were found between the inner surface of the crown and the abutment of the supporting implant. What is the cause of mobility of the orthopedic structure?

2. When taking an impression on the implants, the doctor used A-silicone impression material. However, the impression did not meet quality requirements: poor adhesion to the tray, unclear contours of the ledges of natural teeth and marginal gum in the area of the implants. What could have caused the poor quality of the impression?

3. When taking an impression from implants with divergence in the area of missing teeth 45, 46, using the direct transfer method, deformation and damage of the impression material occurred. Who made the mistake (the doctor or the dental technician) and how can one eliminate it?

4. Patient V., 35 years old, sought prosthetics with implants in the area of the missing tooth 45. The tooth was removed a year ago. What structures can be used in prosthetics on implants?

5. During dynamic observation of patient N., 47 years old, after implantation, mobility of the implant was detected in the area of the missing tooth 37. What is the possible cause of implant mobility and ways to eliminate it?

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.
3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

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5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 9

Subject: Features of prosthetics using dental implants in the manufacture of removable dentures.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to teach students to apply various methods of treating patients with removable dentures using dental implants, to teach how to determine indications and contraindications according to clinical protocols for various types of removable structures and dental implants. To familiarize students with the types of dental implants for removable prosthetics

Objectives of the lesson:

1. To teach students the general principles of treating patients with partial and complete adontoma with removable structures using dental implants.
2. To familiarize students with the indications and contraindications for the use of removable dentures supported by dental implants.
3. To familiarize students with the main types of dental implants for removable prosthetics used in medical practice to restore the integrity of the dentition.
4. To familiarize students with the clinical and laboratory stages of manufacturing removable structures supported by dental implants.
5. To teach students to identify errors and complications in prosthetics with removable structures using dental implants.

Class location - the clinical setting.

Practical skills mastered during the class:

Planning orthopedic treatment of patients with anodontia with removable dental prosthesis structures supported by dental implants using cone-beam computed tomography.

Form of control of the practical class: control survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from human anatomy: the anatomical structure of the upper and lower jaws in terms of age and after tooth extraction;

- from general dentistry: materials science and laboratory technology for making prostheses;
- from radiation diagnostics: methods of X-ray examination of the dentoalveolar system.

Control questions from related disciplines:

1. Anatomy of the maxillofacial region.
2. Features of blood supply and innervation of the maxillofacial region.
3. Materials used for implantation. Requirements imposed к ним.

Control questions:

1. Indications and contraindications for the use of removable dentures supported by dental implants.
2. Types of dental implants used as support for prosthetics with removable structures, their characteristics. (classification, types and structural elements of dental implants).
3. Clinical and laboratory stages of manufacturing removable structures supported by dental implants.
4. Dynamic observation after prosthetics with removable structures supported by dental implants.
5. Complications in prosthetics with removable structures using dental implants.

Clinical and laboratory stages of manufacturing removable dental prostheses supported by implants

Clinical stages	Laboratory stages
Taking preliminary (anatomical) impressions from both jaws, casting models	
	Making a custom tray to obtain a working impression
Fitting the tray, fixing the impression transfers, obtaining a working (functional) impression, determining the central occlusion	
	Casting the working model, fixing the models in the articulator
	Selection and milling of abutments
	Modeling of a prosthesis frame with locking fasteners
	Casting, processing of the frame, fitting of the frame on the model
Fitting the frame in the clinic with locking joints	
	Application of cladding (if necessary)
Fitting the prosthesis in the clinic, obtaining a working (functional) impression	
	Production of bite rollers on wax bases
definition of central occlusion	
	Teeth placement
Checking the alignment of teeth	
	Final modeling of removable denture, replacement of wax with plastic, grinding, polishing of denture

Fitting and fixing the prosthesis. Instructions to the patient on caring for the removable prosthesis and implants.	
Correction of the prosthesis	

Prosthetics using dental implants for the production of removable dentures is a highly effective method of restoring lost teeth, which combines the advantages of implants and removable dentures.

Benefits of using implants for removable dentures:

1. Stability: Implants provide a secure hold for the denture, preventing it from shifting when chewing or speaking.
2. Comfort: Patients often find that implant-supported dentures are more comfortable than traditional dentures, which can cause discomfort and gum irritation.
3. Bone preservation: Implants help prevent jawbone loss that can occur when teeth are lost.
4. Improved function: Implant-supported dentures allow patients to chew and speak better, improving their quality of life.

Types of removable dentures on implants:

1. Complete removable dentures on implants: Used when all teeth in the dental row are missing. Usually installed on 4-6 implants to ensure stability.
2. Partial removable dentures on implants: Used when several teeth are missing. Implants can serve as support to hold the partial denture.

After surgery and implant integration, the doctor receives anatomical impressions to make a custom tray, which, after fitting, can be used both for a removable denture and for taking impressions from impression transfers.

For removable dentures, an open method of taking impressions is used. It is carried out using custom trays and large impression transfers, according to the location of which holes are cut in the tray. When applying the impression tray, the outer edge of the impression modules passes through it. After the impression material has hardened, the fixing screw of the impression modules is unscrewed and the impression is removed from the oral cavity together with the impression modules, to which the implant analogues are then attached.

This type of impression is obtained by simultaneously introducing two masses of different consistencies, with the less fluid mass being placed on the tray, and the more fluid mass being introduced into the implant area - "sandwich technique". Another option is to use a special material for single-layer impressions "Impregum".

Determination of the central occlusion and the central relationship of the jaws is carried out in the usual ways. In complex clinical cases, these procedures should be carried out using a face bow and individual adjustment of the articulator parameters.

A further removable denture can be made using various materials (acrylic, ceramics) and will have special fasteners for a secure connection with the implants. After the removable denture is made, it is installed on the implants, and the doctor checks its fixation and comfort.

Dynamic monitoring of patients with implants

After fixing the finished prosthesis in the oral cavity, the stage of dynamic monitoring of the functioning dental implants begins. During this period, the patient must perform adequate hygienic care for the parts of the implant protruding above the gum level and the prosthesis. For these purposes, specially produced sets of tools for mechanical cleaning should be used. In addition to regular toothbrushes, special inclined single-bundle, as well as soft children's brushes, electric brushes, brushes with nylon fibers, brushes with magnetically charged water are used. In the arsenal of toothpastes, it is necessary to choose pastes characterized by low abrasiveness, as well as from among those that contain components for the prevention of inflammatory processes. To

treat hard-to-reach areas, patients should use interdental brushes or manual dental brushes, as well as threads and strips, which are united by the concept of "floss". Thorough mechanical cleaning should be performed on all sides of the prosthesis, with special attention to those parts of the structure that are adjacent to the gum. It is not recommended to use toothpaste in these areas. In this case, it is better to moisten the brush with antiseptic preparations (for example, 0.1% chlorhexidine solution). Oral hygiene kits are produced for these purposes, allowing for irrigation and jet treatment of teeth, gums and prostheses. Oral hygiene procedures should preferably be supplemented with rinsing with antiseptic solutions, herbal decoctions and elixirs with bacteriostatic and anti-inflammatory effectiveness. Dispensary management of a patient with dental implants involves regular medical monitoring of oral hygiene and professional hygiene procedures. At this time, it is important to determine the periodontal and hygienic indices. The patient should receive the necessary recommendations for oral care from the dentist. If soft and hard supragingival and subgingival deposits appear, they should be removed with excavators and hooks made of plastic and Teflon, as well as with soft rubber or plastic polishers powered by an electric drive using low-abrasive grinding pastes. These measures are performed by a periodontist or hygienist 1-4 times a year. Ultrasound is a rational physiotherapeutic means of professional hygiene. Ultrasonic cleaning techniques can be used both directly in the oral cavity for fixed dentures and in special baths for conditionally removable and removable structures. However, contact of ultrasonic instruments with titanium surfaces should be avoided. When dismantling conditionally removable dentures, implant heads covered with a large amount of hard plaque and with gross violations of the purity of the surface polishing are replaced with similar new structures. Over time, it is recommended to update all fixing screws. Actions aimed at normalizing the hygienic status are the first component of medical management of dental implants. The second equally important factor in the care of prostheses is considered to be regular checking of occlusal relationships, if necessary, their correction by selective grinding of natural and artificial teeth. Dynamic monitoring of implants implies regular assessment of osseointegration. Testing the condition of tissues surrounding the implant begins with probing the implant-gingival groove. Its acceptable depth is recognized as 4 mm. Blood appearing during probing may be the first sign of trouble. The next manifestation of integration disorder is pronounced hyperemia and swelling of the gum surrounding the implant, as well as its mobility. Clinical assessment of the stability of dental implants is carried out by palpation and percussion methods. In this case, there should be no manual signs of implant mobility, and the percussion sound should not be dull. The resistance of the surrounding tissue to loads can be studied using mechanical or electrical gnathodynamometers, in particular using the Vizir and Vizir E 1000 devices.

The degree of implant stability is objectified using Periotest devices. These devices note the duration of the cessation of vibrations of the device tip. The conditional index of implant periotestometry should not exceed the value of "+5", and the best indicators are considered to be negative numbers from "-4" to "-2".

The most reliable method for monitoring functioning implants is an X-ray study, which allows determining changes in the condition of the bone tissue adjacent to the implants in the marginal and periapical areas. It should be taken into account that the X-ray-determined loss of the vertical size of bone tissue averages about one and a half millimeters during the first year of implant functioning. And then by 0.1–0.2 mm per year.

Bone adaptation to loaded implants is also tested using ultrasound - the echoosteometry method or ultrasound densitometry. Such a study allows you to assess quickly the level of bone density in the implant area. The study can be carried out using the Russian device "Echoosteometer EOM-01ts".

Rheography, polarography, Dopplerography and photoplethysmography are also effective research methods.

As criteria for judging the success of implant treatment, one should use the implant functioning indicators (IFI), which were proposed by M.Z. Mirgazizov and are expressed in values from "1" to "0":

1 - the implant is immobile or mobile within the physiological tissue compliance, there is no gum inflammation and bone pocket;

0.75 - periodically occurring mobility of the implant of I-II degree, the process of gum inflammation appears and disappears, there is no bone pocket (compensation stage);

0.5 – constant mobility of the implant of I-II degree, formation of a bone pocket (subcompensation stage);

0.25 – mobility of the implant of III degree, pronounced bone pocket (decompensation stage);

0 – complete disappearance of bone tissue surrounding the implant and its expulsion from the jaw by granulation tissue.

A reasonable assessment and prognosis of the results of dental implantation is carried out one year after fixation of the dental prosthesis to the implants. With regard to individual treatment periods using implants, there are international standards according to which positive functional and cosmetic results of restoration of dentition after 5 years should be determined in 90–95% of patients, after 10 years – in 85% and after 15 years – in 80% of patients.

SITUATIONAL TASKS

1. Patient T., 50 years old, complains of mobility of the orthopedic structure made on implants. Upon examination, microgaps were found between the inner surface of the crown and the abutment of the supporting implant. What is the cause of mobility of the orthopedic structure?

2. When taking an impression on the implants, the doctor used A-silicone impression material. However, the impression did not meet quality requirements: poor adhesion to the tray, unclear contours of the ledges of natural teeth and marginal gum in the area of the implants. What could have caused the poor quality of the impression?

3. When taking an impression from implants with divergence in the area of missing teeth 45, 46, using the direct transfer method, deformation and damage of the impression material occurred. Who made the mistake (the doctor or the dental technician) and how to eliminate it?

4. Patient V., 35 years old, sought prosthetics with implants in the area of the missing tooth 45. The tooth was removed a year ago. What structures can be used in prosthetics on implants?

5. During dynamic observation of patient N., 47 years old, after implantation, mobility of the implant was detected in the area of the missing tooth 37. What is the possible cause of implant mobility and ways to eliminate it?

LITERATURE

Basic:

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3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 16 p.

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5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 10

Subject: Features of orthopedic treatment in patients with diseases of the oral mucosa.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to teach students to identify clinical manifestations of diseases of the oral mucosa and to teach students the basic methods of diagnosis and orthopedic treatment for diseases of the oral mucosa.

Objectives of the lesson:

1. To teach students the general principles of treating patients with diseases of the oral mucosa.
2. To familiarize students with the primary and secondary elements of damage to the oral mucosa.
3. To present methods used in the diagnosis of diseases of the oral mucosa.
4. To familiarize students with the clinical and laboratory stages of manufacturing removable structures for diseases of the oral mucosa.
5. To teach students to determine complications in prosthetics with removable structures for diseases of the oral mucosa.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from human anatomy: the anatomical structure of the upper and lower jaws in terms of age and after tooth extraction;
- from general dentistry: materials science and laboratory technology for making prostheses;
- from radiation diagnostics: methods of X-ray examination of the dentoalveolar system.

Control questions from related disciplines:

1. Structure of the oral mucosa.
2. Elements of damage to the oral mucosa.
3. Removable partial dentures with two-layer bases. сами, их характеристика.

Control questions:

1. Primary lesions of the oral mucosa.
2. Secondary lesions of the oral mucosa.
3. Additional methods of examination used in the diagnosis of diseases of the oral mucosa.
4. Etiology, clinical picture, diagnostics and features of orthopedic treatment for thrush, papillomatosis and angular cheilitis.
5. Etiology, clinical picture, diagnostics and features of orthopedic treatment for leukoplakia and leukokeratosis of the palate.
6. Etiology, clinical picture, diagnostics and features of orthopedic treatment for gingival fibromatosis and lichen planus.

THE SCHEME OF INDICATIVE ACTIONS ON THE TOPIC: "CHRONIC DISEASES OF THE ORAL MUCOSA AND FEATURES OF THEIR ORTHOPEDIC TREATMENT"**1. History taking:**

- **thrush** - complaints of burning, dryness of the mucous membrane;
- **papillomatosis** - does not cause discomfort or concern. Complaints of roughness in the area of the hard palate, pain when using removable dentures, their poor fixation;
- **angular cheilitis** - complaints of pain when opening the mouth wide, frequent bleeding from cracks in the corners of the mouth;
- **simple leukoplakia** - complaints of dry compaction of the mucous membrane;
- **warty leukoplakia** - complaints of roughness and the presence of protrusions on the mucous membrane;
- **erosive and ulcerative leukoplakia** - complaints of pain when eating, especially in the area of its localization;
- **nicotinic leukokeratosis of the palate** - complaints of roughness of the hard palate;
- **fibromatosis of the palate** - complaints of increased gum volume; - **lichen planus** - complaints of the appearance of spots and elevations. In cases of ulceration, pain is added.

2. History taking:

- **thrush** - long-term use of antibiotics, more often with diabetes;
- **papillomatosis** - occurs with long-standing chronic fungal denture stomatitis of the upper jaw;
- **angular cheilitis** - with a decrease in the height of occlusion (the corners of the mouth are lowered), as well as with the addition of a fungal, less often with staphylococcal infection;
- **leukoplakia** - occurs more often in pipe smokers, also contribute to the appearance of sharp edges of teeth, caries, poorly fitted dentures, a large amount of tartar, galvanic currents;
- **nicotine leukokeratosis** - occurs, as a rule, in heavy smokers, more often in old age;
- **gingival fibromatosis** - the cause of occurrence is not clear, hereditary predisposition and chronic inflammation or injury are assumed;
- **red flat lichen** - the cause of occurrence is not clear, often appears after a nervous shock.

3. Objective examination:

- **thrush** - consists of small white colonies protruding above the surface on the inner surface of the lips, on the wall of the tongue, palate, on the cheeks, painless on palpation;
- **papillomatosis** - manifests itself in the form of a significant number of compacted growths (nodules) of varying sizes;

- **angular cheilitis** - characterized by a decrease in the lower angle of the face, drooping corners of the mouth, the presence of cracks surrounded by an inflammatory rim, due to pathological abrasion of teeth or improperly made dentures;
- **simple leukoplakia** - keratinized plaques, spots or plaques of a continuous form are found, often with a mosaic pattern due to small cracks;
- **warty leukoplakia** - there are restrictions, warts covered with thickened epithelium with an uneven surface, protruding from the mucous membrane;
- **erosive-ulcerative leukoplakia** - the keratinized mucous membrane is ulcerated, painful on palpation, often (30%) malignancy occurs
- **nicotinic leukokeratosis of the palate** - white wart-like protrusions of various sizes form on the surface of the hard palate, which have a retracted red dot in the center;
- **gingival fibromatosis** - extensive growths of connective tissue of the gum are observed, leading to significant deformation of the alveolar process and disruption of chewing function;
- **lichen planus** - papules in the form of a triangle are located on both sides of the mucous membrane of the cheeks. Sometimes on the back of the tongue or under the tongue, papules are located in the form of snowflakes or rings, in exceptional cases, papules appear on the gums, on the palate. Rashes on the mucous membrane are often combined with rashes on the skin.

4. Additional examination data:

- **fungal diseases** - taking a smear from the pathological material, fixing it over the flame of an alcohol lamp, staining it with methylene blue;
- **leukoplakia, nicotine leukokeratosis, gingival fibromatosis, lichen planus** - in case of surgical removal of the lesion or if malignancy is suspected, a biopsy is performed.

5. Therapy:

- **thrush** - treatment of the oral cavity with 20% boric glycerin, rinsing with 2% soda solution, nystatin tablets internally;
- **papillomatosis** - 1) antifungal therapy (see treatment of thrush);

it is desirable to make the base of the denture from metal, overnight place the denture in a 2% soda solution. Before the final prosthetics, carry out surgical preparation, consisting of removing the mucous membrane from the uneven surface using an Altman spoon;

final prosthetics of the patient;

- **angular cheilitis** - 1) antifungal therapy (see treatment of thrush), if streptococcus is cultured, then antibiotics are prescribed;
restoration of the occlusal height by rational prosthetics;

- **leukoplakia** - treatment consists of establishing the cause. For this purpose, smoking, drinking hot, spicy and alcoholic drinks are prohibited. Sharp edges of teeth are ground down, roots are removed, poorly fitting dentures are replaced, and if there is a potential difference, metal fillings and dentures are removed. Vitamins of group B and vitamin A are prescribed locally.

If treatment is ineffective, surgical removal of the entire leukoplakic mucous membrane is performed. When constructing dentures for leukoplakia, it is necessary to optimally restore the height of occlusion and correctly model the volume of the edges of the denture bases, correctly orient the occlusal plane and create a tubercular overlap that prevents pinching of the mucous membrane, as well as biting of the lips and cheeks, especially in the affected areas. Polish the dentures with particular care. Clasps should be hidden or wide, tightly covering the tooth.

- **nicotine leukokeratosis** - symptoms usually disappear when smoking is stopped. There are some peculiarities in prosthetics: the leukokeratosis focus cannot be a bed for a denture;

- **gingival fibromatosis** - treatment consists of removing connective tissue growths, including the periosteum, with mandatory preservation of the teeth. Then rational prosthetics are carried out according to indications;

- **lichen planus** - treatment consists of removing the roots, grinding down the sharp edges of the teeth, removing low-quality dentures. A salt-free diet is prescribed, locally - vitamin A and chamomile solution. The peculiarities of prosthetics are that the prosthesis does not affect the mucous membrane (clasp and bridge dentures), preference is given to noble alloys in the manufacture of dentures. In the presence of subjective sensations, such as a burning sensation, paresthesia, etc., removable dentures are excluded altogether.

Preventive examination of patients with chronic diseases of the oral mucosa - all patients are registered with the dispensary and 1-2 times a year, depending on the disease, are called for examination by a doctor. If necessary, the prosthesis is corrected.

MORPHOLOGICAL STRUCTURE OF THE ORAL MUCOUS MEMBRANE

It consists of 3 layers: epithelial, mucous and submucous. (fig.10.1).



Fig. 10.1. Oral mucosa:

1- epithelium; 2- mucous layer proper; 3- submucous layer

The epithelium of the oral mucosa is multilayered and flat. It has basal and spinous layers. In some areas of the mucosa there are zones of incomplete or even complete keratinization. It occurs in those areas that are most exposed to mechanical, chemical and thermal effects during human life. This gives grounds to assert that the process of keratinization of the epithelium in the oral cavity is protective in nature.

In some areas of the mucous membrane epithelium, melanocytes are localized - cells that form melanin. They determine the pigmentation of the mucous membrane of the oral cavity in the norm. A particularly large number of melanocytes are noted in people with dark skin. Areas of pigmentation resemble the manifestation of Addison's disease associated with adrenal insufficiency.

The mucous layer itself has the appearance of papillae and undulates into the epithelial layer. It is represented by dense connective tissue consisting of the main substance, fibrous structures and cells. Connective tissue performs a protective function - it creates a mechanical barrier.

The submucous layer consists of comparatively looser connective tissue.

There are many blood and lymphatic vessels in the oral mucosa.

Due to the functional features of different parts of the oral mucosa, there is a pronounced difference in the structure of its individual sections. This anatomical difference is due to the presence or absence of the submucous layer, histological - the severity or absence of the phenomenon of keratinization of the epithelial layer.

The mucous membrane in different parts of the mouth has a different structure.

The lips consist of a muscular layer covered on the outside by skin, and on the side of the vestibule of the oral cavity by non-keratinizing stratified squamous epithelium. However, on the border of the mucous membrane and the muscular layer there is a large number of small salivary glands, which give the lips softness. The red border of the lips is covered by stratified squamous keratinizing epithelium, in this area there are sebaceous glands.

On the cheeks, the mucous membrane has a pronounced submucous layer and therefore is mobile. When opening the mouth, it becomes smooth, and when the jaws are closed, it becomes folded. Often, especially if there is a lot of fatty tissue in the cheeks, imprints of teeth are formed on their mucous membrane. On the mucous membrane of the cheeks at the level of the second molars of the upper jaw, the ducts of the parotid salivary glands open. In the mucous membrane of the cheeks, under the epithelium, there are sebaceous glands (Fordyce glands), sometimes forming conglomerates of a yellowish hue. The epithelial layer of the cheeks is not keratinized.

The gum is a mucous membrane covering the alveolar process of the upper and lower jaws. It has no submucous layer, so it is tightly adjacent to the periosteum of the alveolar process. The epithelium of the alveolar process of the marginal part of the gum has pronounced signs of keratinization.

The mucous membrane of **the hard palate** is not uniformly structured in different areas. In the area of the palatine suture and in the areas of the palate adjacent to the teeth, the submucous layer is absent, and the mucous membrane tightly closes with the periosteum. In the anterior part of the hard palate, the submucous layer contains fatty tissue, and in the posterior part there are mucous glands, which ensures the compliance of these areas of the mucous membrane. On the palate near the central incisors of the upper jaw there is an incisive papilla, which is located above the mouth of the incisive canal. In the anterior third of the hard palate there are 3-4 folds of mucous membrane.

The epithelial layer of the hard palate is keratinized, as a result of which it is comparatively lighter.

Tongue. The tongue is a muscular organ, very mobile in all directions. It has a tip, body and root, as well as an upper (back) and lower surface, lateral edges. The submucosal layer is absent in the tongue, and its mucous membrane is tightly fixed to the muscles. On the posterior third of the tongue, there is a cluster of lymphoid tissue (large or smaller) in the form of follicles. Crypts penetrate the lymphoid tissue. This tissue is pinkish in color, sometimes with a bluish tint. This lymphoepithelial formation is called the lingual tonsil. Under the mucous membrane of the tongue, especially in its posterior part, there are small salivary glands, the excretory ducts of which open on the surface of the tongue. The mucous membrane of the tongue itself, together with the epithelium covering it, forms protrusions - papillae of the tongue. The latter are filiform, mushroom-shaped, groove-shaped and leaf-shaped (Fig. 10.2).

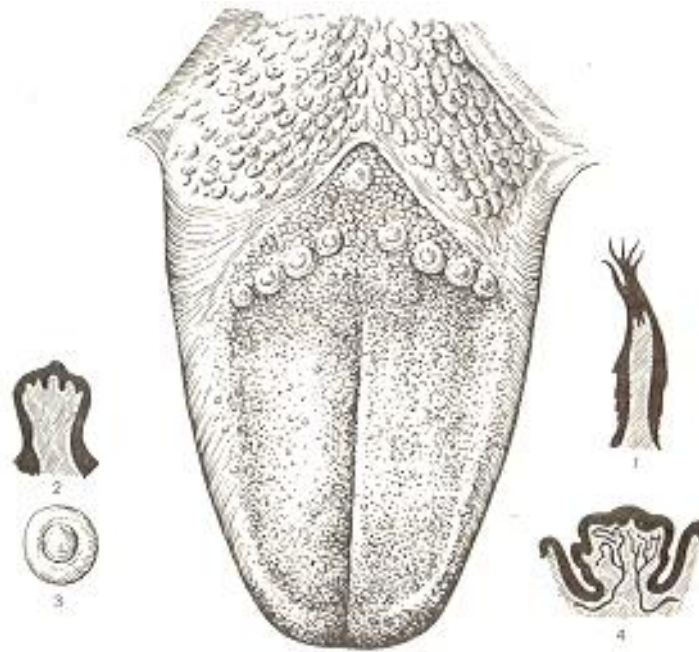


Fig. 10.2. Tongue covered with papillae

1 - filiform; 2 - fungiform; 3 - vallate; 4 - foliate

Filiform papillae are the most numerous. They are located over the entire surface of the back of the tongue. Their tops are keratinized. If the process of normal rejection of keratinized scales is disrupted, which happens with gastrointestinal diseases and other pathologies, a white coating (“coated” tongue) forms on the tongue. Intensive rejection of the outer layer of the epithelium of filiform papillae in a limited area is also possible. This phenomenon is called desquamation.

Fungiform papillae are localized in large numbers on the tip of the tongue, and in smaller numbers on its back. The epithelium covering the papillae is not keratinized, so they look like red dots slightly elevated above the level of the filiform papillae. Taste buds with abundant blood supply are located in the fungiform papillae.

Foliate papillae are located in groups (15-20), along the edges of the posterior parts of the tongue in front of the circumvallate papillae. They form small protrusions. Sometimes they are considered pathological. They also contain taste buds.

The vallate papillae are the largest unpaired (9-11) papillae of the tongue. They are located in the form of the Roman numeral V. Each of them is surrounded by a groove into which the excretory ducts of the small salivary glands open. The walls of the vallate papillae contain a large number of receptors (up to 150 bulbs).

On the lower surface of the tongue, the mucous membrane is more mobile and in the middle part passes into the frenulum and the lining of the floor of the oral cavity. Two sublingual folds extend from the frenulum on both sides.

On the lateral surface at the root of the tongue, a vascular (venous) plexus is localized in greater or lesser quantities, which is sometimes mistaken for pathology.

As a person ages, a number of changes occur in the structure of the oral mucosa: thinning of the epithelial layer, increased hyperkeratosis, the appearance of signs of epithelial degeneration

(cell nuclei wrinkle and decrease in size). In fibrous structures, elastic fibers thicken and collagen bundles become frayed. These structural changes cause significant compaction of the mucous membrane. In people over 60 years of age, the integrity of the basement membrane is disrupted, which can lead to deeper epithelial penetration into the mucous layer itself.

EXAMINATION OF THE ORAL MUCOSA

In this study, first of all, epy examination of the oral cavity is performed, paying attention to the color of the mucous membrane and the degree of its moisture. It is normally pale pink.

If there is keratinization, as indicated by a grayish-white area, the density and size of the latter, the degree of its adhesion to the underlying tissues are determined. The level of elevation above the mucous membrane and soreness is also established. Identification of these signs is especially important due to the fact that sometimes they serve as a basis for active therapeutic intervention, since foci of hyperkeratosis of the oral mucosa are considered precancerous conditions

If any pathological change is detected on the oral mucosa (ulcer, erosion, hyperkeratosis, etc.), it is necessary to exclude or confirm the possibility of exposure to a traumatic factor. This is necessary for making a diagnosis and choosing the appropriate treatment. However, it should be remembered that it is possible to detect trauma to the mucosa by teeth or a prosthesis if the lower jaw and tongue are in a state of physiological rest, i.e. with the jaws closed. Correct determination of the lesion element largely ensures the correct diagnosis.

The lesion elements are divided into primary and secondary, arising in place of the primary ones.

Primary lesions include a spot, nodule, tubercle, node, vesicle, pustule, bubble, blister, cysts.

Secondary lesions include erosion, ulcer, crack, crust, scale, scar, pigmentation.

A *spot* is a limited area of discolored oral mucosa. There are spots of inflammatory and non-inflammatory origin. An inflammatory spot up to 1.5 cm in diameter is called roseola, more than 1.5 cm - erythema. Spots occur with a burn, injury or as a manifestation of common diseases - measles, scarlet fever, B₁₂ hypovitaminosis. Pigment spots resulting from melanin deposition (congenital coloration of areas of the mucous membrane), taking medications containing bismuth and lead, are classified as a group of spots of non-inflammatory origin (Fig. 10.3).

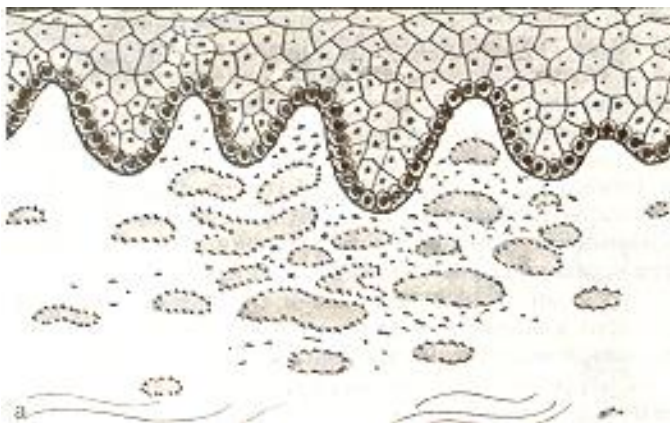


Fig. 10.3. Spot

A *nodule (papule)* is a cavityless element of inflammatory origin up to 5 mm in size, rising above the level of the mucous membrane and capturing the epithelium, as well as the superficial layers of the mucous membrane itself. Small-cell infiltration, hyperkeratosis and acanthosis are revealed morphologically. A typical example of papules on the mucous membrane of the oral cavity is lichen planus. Merged papules, if their size reaches 5 mm or more, form a plaque (Fig. 10.4).

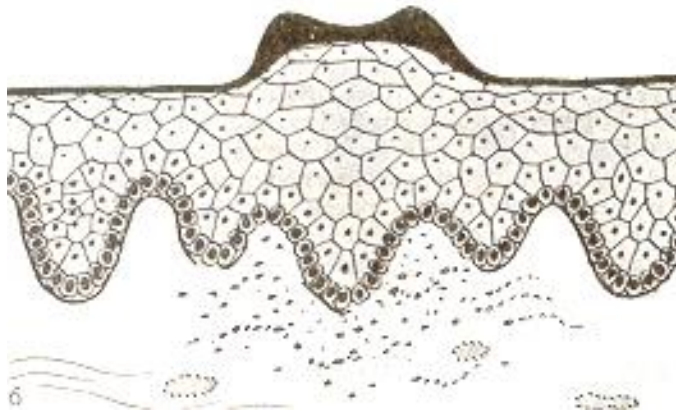


Fig. 10.4. Nodule

A node differs from a nodule in its larger size and in that during its formation all layers of the mucous membrane are involved in the inflammatory process. Palpation reveals a slightly painful infiltrate (Fig. 10.5).

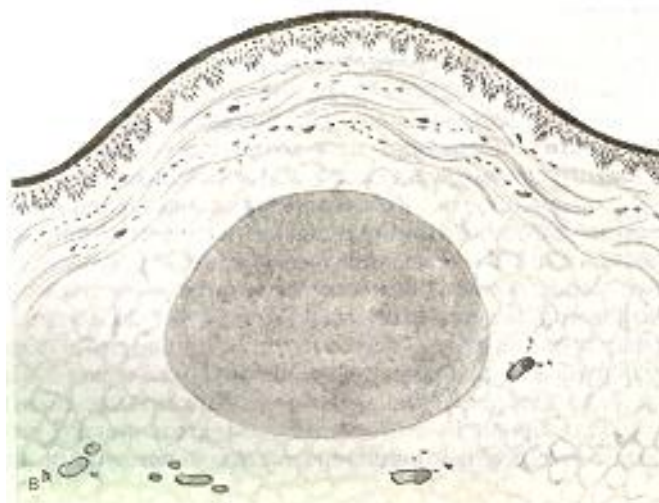


Fig. 10.5. Node

The *tubercle* (Fig. 10.6) as an element of inflammatory origin captures all layers of the mucous membrane. Its size varies within 5-7 mm. It is dense, painful upon palpation. Its mucous membrane is hyperemic, edematous. The tubercle is prone to decay, which is accompanied by the

formation of an ulcer. When the latter heals, a scar is formed. Tubercles are formed during tuberculosis.



Fig 10.6. Tubercule

A *wheel* (Fig. 10.7) is a sharply expressed limited swelling of the mucous membrane itself. It occurs during an allergic reaction (Quincke's edema) and other pathologies.

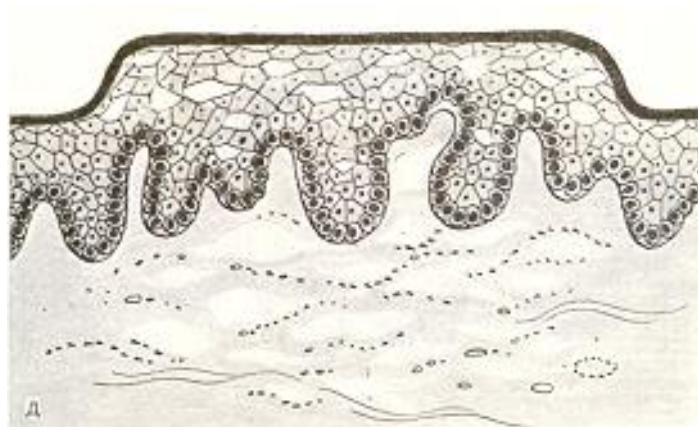


Fig. 10.7. Wheal

A *vesicle* (Fig. 10.8) is a cavitory intraepithelial formation of a round shape up to 5 mm in size. It protrudes above the level of the mucous membrane, is filled with serous or hemorrhagic contents and is easily opened. Vesicles occur with viral lesions, shingles, foot-and-mouth disease, herpes.

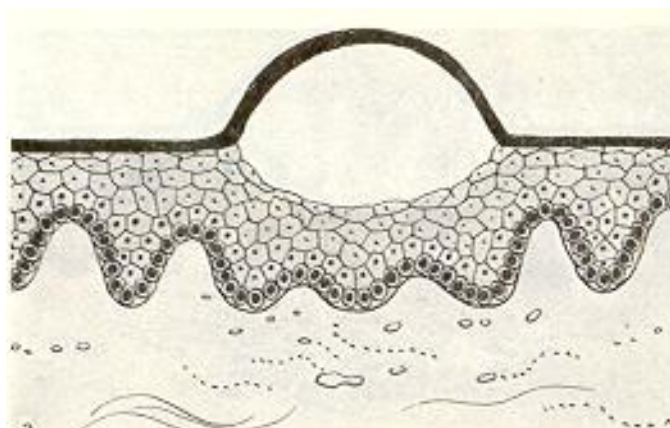


Fig 10.8. Vesicle

The pustule (Fig. 10.9) is similar to a vesicle, but with purulent contents. It appears on the skin and the red border of the lips.

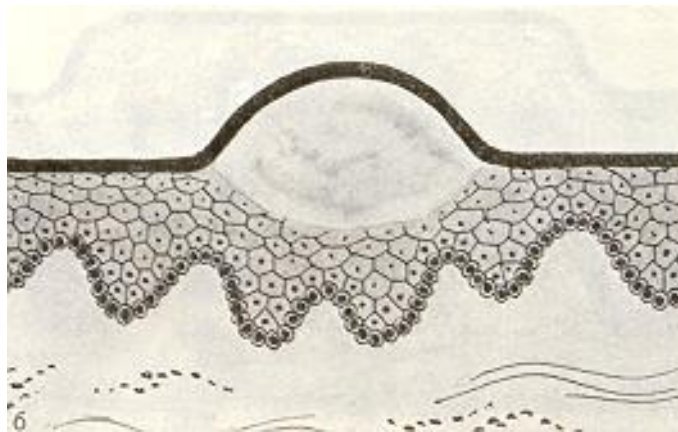


Fig. 10.9. Pustule

A blister differs from a vesicle in its larger size. It can be located intraepithelially (Fig. 10.10) as a result of epithelial cell stratification (for example, in acantholytic pemphigus) and subepithelially (Fig. 10.11), when the epithelial layer peels off (in erythema multiforme exudative, allergies and other diseases). In the oral cavity, blisters are very rare (practically invisible), since they open and an erosion forms in their place. Often, a blister cap is noted along the edges of the erosion. The contents of the blister are usually serous, less often hemorrhagic.

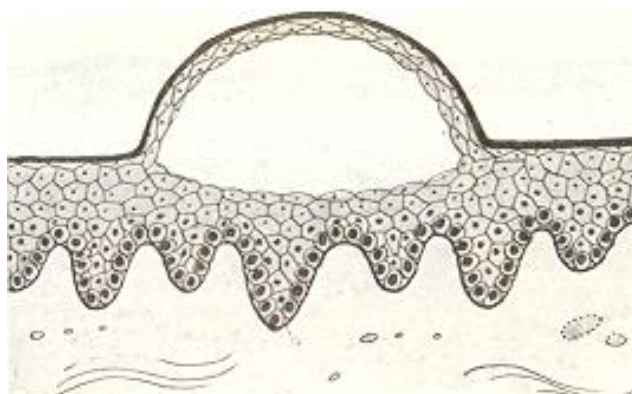


Fig. 10.10. Intraepithelial location of the blister

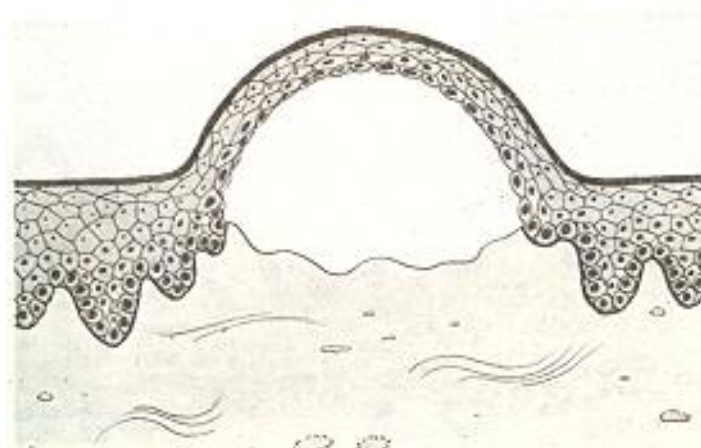


Fig. 10.11. Subepithelial location of the bladder

A cyst (fig. 10.12) is a cavity formation, has an epithelial lining and a connective tissue membrane.

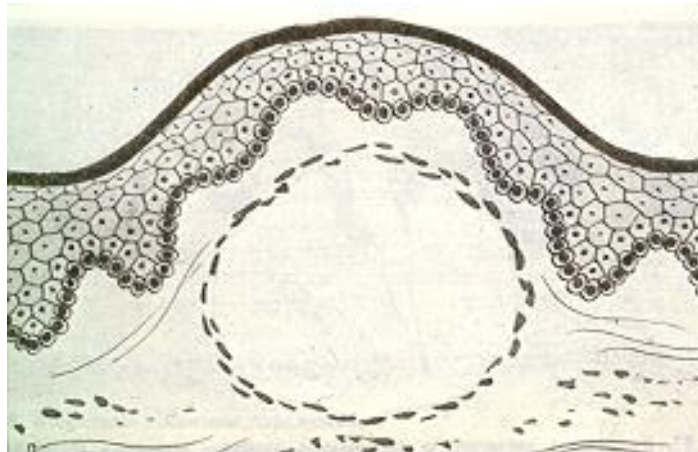


Fig. 10.12. Cyst

Erosion (Fig. 10.13) is damage to the mucous membrane within the epithelium that occurs after the opening of a vesicle, bubble, or at the site of a papule, plaque, as well as as a result of trauma. It heals without scar formation.

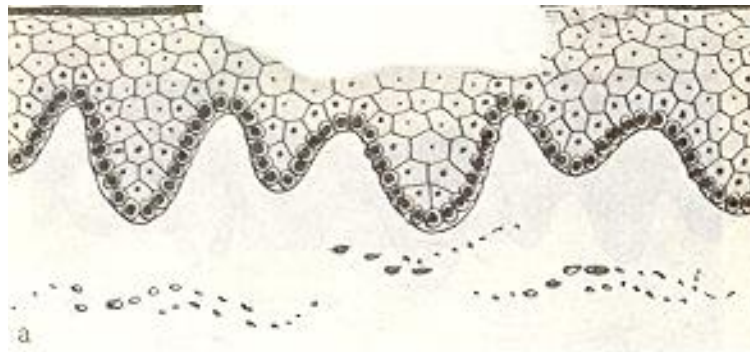


Fig. 10.13. Erosion

An *aphtha* is an oval-shaped erosion covered with fibrous plaque and surrounded by a hyperemic rim.

An *ulcer* (Fig.10.14) is a defect of all layers of the oral mucosa, which occurs during trauma, tuberculosis, syphilis, or the disintegration of a neoplasm. Unlike erosion, an ulcer has a bottom and walls. After healing, a scar is formed.

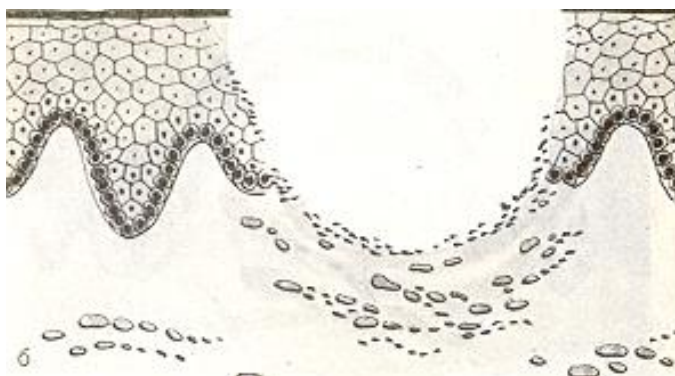


Fig. 10.14. Ulcer

A *crack* (Fig. 10.15) is a linear defect that occurs due to the loss of elasticity of the mucous membrane.

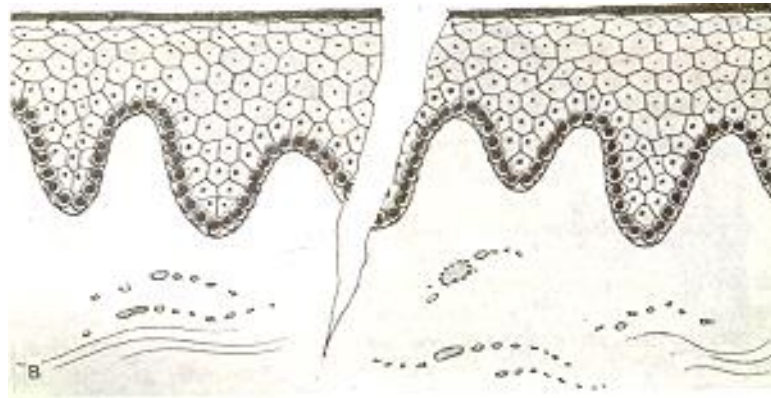


Fig. 10.15. Crack

Scales (Fig. 10.16) are layers of epithelium that form as a result of a disruption in the process of its desquamation.



Fig. 10.16. Scale

Crust (Fig. 10.17) is a dried exudate that usually forms at the site of cracks and erosions.

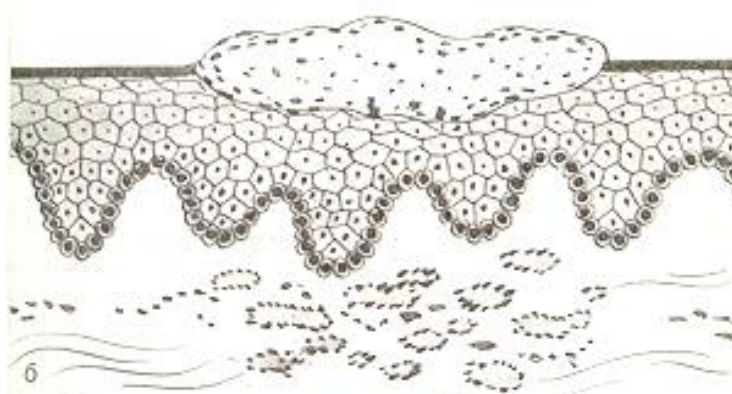


Fig. 10.17. Crust

A scar (Fig. 10.18) is a defect of the mucous membrane replaced by connective tissue.



Puc. 10.18. Scar

SITUATIONAL TASKS

1. A patient with lichen planus in the acute stage came to the orthopedic dentistry clinic for the bridge prosthesis with support on teeth 34, 35, 38. What is the tactics of the orthopedic dentist, what designs of prostheses and from what materials should preference be given?

2. Patient S., 61 years old, came to the orthopedic dentistry clinic with complaints of angular cheilitis. According to the patient, the disease developed six months after prosthetics with complete removable dentures on both jaws, it is poorly amenable to therapeutic treatment, and frequent relapses occur. Objectively, a decrease in the height of the lower part of the face by 4 mm, drooping corners of the mouth, and the severity of the chin and nasolabial folds are determined. The dentures correspond to the boundaries of the prosthetic bed, are well fixed, in the position of the central relationship, dense multiple contact of the antagonist teeth is noted.

What is tactics of the dentist?

3. Patient A., 46 years old, complains of biting her right cheek. According to the patient, about 5 months ago she had metal-ceramic bridge prostheses made for the upper and lower jaws with supports on teeth 13, 16 and 45, 47. The patient has been smoking for over 20 years. An area of leukoplakia is objectively determined on the inner surface of the cheek along the line of closure of the teeth on the right and left. In addition, there is an area of chronic trauma with imprints of teeth on the right. When closing the teeth in the position of central occlusion on the right, the palatine tubercles of the upper premolars and molars are located at the same level as the lingual tubercles of the lower antagonists. What could be the cause of leukoplakia? What is the tactics of the orthopedic dentist?

4. Patient R., 49 years old, complains of a burning tongue and dryness of the oral mucosa. The patient associates these complaints with the prosthetics of stamped and soldered bridge prostheses with a titanium nitride coating on the upper and lower jaws, the prosthetics were completed a month ago. The patient has also recently suffered from pneumonia, having undergone a course of antibacterial therapy. In the oral cavity there are bridge prostheses with supports on teeth 17, 16, 13, 12 and 33, 34, 37. The condition of the prostheses is satisfactory. A white cheesy coating is determined on the back of the tongue; the mucous membrane of the tongue and cheeks is hyperemic. What additional research methods should be carried out to make a final diagnosis? What is the doctor's tactics?

5. Patient L., 37 years old, came to the orthopedic dentistry clinic with complaints of aesthetic disorders, expressed in gum growth over the crowns of teeth 11, 12, 21, 22. Objectively, dense pink formations covering the crowns of the upper incisors are determined in the oral cavity. Teeth 11, 12, 21, 22 have fillings covering more than $\frac{1}{2}$ of the crown surface, with irregularities in marginal fit and a mismatch in color with natural teeth. What additional research methods should be carried out to clarify the diagnosis? What is the doctor's tactics?

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.
3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 11

Subject: Pathological changes in the condition of the body, tissues and organs of the oral cavity associated with the presence of dentures. Galvanosis. Etiology, pathogenesis, clinical manifestations, prevention, treatment methods.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ка	58
6.	Final stage	13

Purpose of the lesson: to study the etiological factors, pathogenesis and clinical picture of galvanosis, to teach students methods of diagnosis, treatment and prevention of galvanosis.

Objectives of the lesson:

1. To master the skills of objective examination of the organs and tissues of the oral cavity in patients with galvanosis.
2. To consider the stages and specifics of examination of patients with symptoms indicating possible intolerance to metal structures.
3. To study diseases with a similar clinical picture.
4. To consider the criteria that orthopedic structures must meet.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from human anatomy: the structure of the oral mucosa, innervation of the maxillofacial region, features of blood supply;
- from general dentistry: materials science and laboratory technology for making prostheses.

Control questions from related disciplines:

1. Anatomical and physiological features of the structure of the oral mucosa.
2. Noble and base metals and metal alloys in dentistry. Composition, properties.
3. Clinical and laboratory stages of manufacturing fixed and removable dentures.

Control questions:

1. What is galvanosis and galvanism?
2. Etiology, pathogenesis, clinical picture of oral galvanosis.
3. Diagnosis of oral galvanosis.
4. Differential diagnosis of intolerance to metal dentures.
5. Methodology for determining the potentials of orthopedic structures.
6. Tactics of an orthopedic dentist in case of oral galvanosis. Prevention methods.

Intolerance of electrogalvanic nature.

One of the three main types of pathological effects on the human body in the presence of metal inclusions in the mouth (along with chemical-toxic and allergic) is electrogalvanic - the damaging effect of galvanic current.

ETIOLOGY

1. Formation of a galvanic cell:
 - due to the difference in electrode potential of various metals in the alloy (can reach 600 mV, has a complex reflex effect on the receptor apparatus of the oral cavity);
 - due to the different composition of identical metal alloys;
 - formation of a galvanic cell due to the different structural state of identical metal alloys.
2. Toxic effects of "heavy" metals and trace elements (Cu, Cd, Cr, etc.).

In the etiology of diseases of the oral mucosa associated with galvanism, at least two factors are necessary:

- a) the presence in the oral cavity of metal inclusions with a negative electrochemical potential, or with a large potential difference, if there are 2 or more metal inclusions in the oral cavity, or a combination of them;
- b) high sensitivity of the oral mucosa, its receptor apparatus, the presence of a general concomitant pathology that reduces this level.

PATHOGENESIS

1. Dissolution of a metal with a more negatively charged potential.
2. The occurrence of an electric current, the magnitude of which depends on the difference in potentials of metal inclusions and the chemical activity of the saliva.
3. Microelements significantly inhibit transaminases, activate acid and alkaline phosphatase, disrupt the regulation of glycolysis and tissue respiration.
4. The activity of proteolytic enzymes and their inhibitors - non-metals - is disrupted, which leads to the development of inflammatory reactions, tissue destruction and circulatory disorders.
5. Violation of the energy volume and lipid peroxidation in the blood.

The electrolysis products of prostheses are absorbed into the body both through the mucous membrane with possible deposition of ions in it, and with food throughout the gastrointestinal tract. A combination of these pathways is possible, which seems to be the most probable and common. All metals and metal alloys immersed in liquid (extract) acquire their own electrochemical potential, which is inherent to each specific product (prosthesis). The intensity of the corrosion process, clinical manifestations of both local and general nature depend on the magnitude of the electrochemical potential. The size of the prosthesis and the homogeneity of the alloy, from which it is made, play an important role. The quality of the prosthesis itself can provoke the clinical picture of galvanosis in the presence of other predisposing factors.

An optimal understanding of the pathogenesis of oral galvanosis involves both knowledge of the factors listed and an understanding of the basic principles of physical chemistry, organic chemistry, physicochemical chemistry, and biocatalytic chemistry. It is important to remember that the human body has ionic, electronic, and semiconductor electrical conductivity, which together provide a wide variety of energy transfer and redistribution both in the intercellular substance and on the membranes of organelle cells. A significant role in the pathogenesis of

galvanosis is played by the fact that dentures of different composition, or sections of dentures (soldered), are washed with saliva from both macroglands and many microglands, which are tightly adjacent to the dentures with excretory ducts for a long period of time, and a floating potential is formed. Its value and sign depend on the nature of the alloy itself, as well as on the pH of the saliva, which changes throughout the day depending on food intake. It is important to know that depolarization of the cell membrane occurs when a voltage of 40-50 mV is applied. The potential difference caused by the prostheses can be 400-500 mV. It can be indirectly assumed that this difference is quite sufficient to excite the receptor apparatus of the oral cavity and form a response reaction of both local tissues and the body as a whole. A favorable situation initially assumes normoergic responses. As the reserve forces decrease and the excitability threshold decreases, both local and general pathology develops.

Risk factors that contribute to the development of galvanosis include:

1. *poorly made dentures;*
2. *soldered dentures;*
3. *large length of dentures;*
4. *the presence of several dentures made of different alloys in the oral cavity;*
5. *the presence of gastrointestinal tract pathology, diseases of the peripheral and central nervous system in patients;*
6. *the fact of taking medications that cause dryness of the oral mucosa.*

CLINIC

1. Galvanosis.
2. Toxic stomatitis.
3. Allergic reactions to metal inclusions.
4. Exacerbation of general somatic diseases.

Intolerance of electrogalvanic nature is a pathological symptom complex. It is expressed by the following signs: metallic taste; taste of salt, bitterness, acid (especially after eating sour foods); paresthesia of the oral mucosa, glossodynia, glossalgia, hypo- or hypersalivation, a feeling of "current passing" when introducing metal objects into the mouth, the development of inflammation of the oral mucosa, hyperemia, erosions, ulcers, increased atrophic or hypertrophic changes in the mucous membrane of the tongue, gums, various forms of gingivitis and stomatitis, as well as hyperkeratosis in the form of lichen planus or leukoplakia, impaired (perverted) taste sensitivity.

Subjective sensations are noted by patients 1-2 months after prosthetics with metal prostheses, or after repeated orthopedic treatment with the addition of a new prosthesis. It is necessary to take into account that the above symptoms can also manifest in other pathological conditions of the body, for example, in liver diseases, achilic gastritis, oral candidiasis, with a decrease in the height of the lower part of the face, etc.

DIAGNOSTICS (CLINICAL METHODS):

1. Survey (identification of characteristic complaints and collection of anamnesis).
2. Examination (of the mucous membrane and organs of the oral cavity).
3. Evaluation of the quality and correctness of the design of dentures.
4. Clinical blood test; exposure test; provocative test.

DIAGNOSTICS (LABORATORY METHODS):

1. Chemical and spectral analysis of the oral fluid (determination of the qualitative composition and quantitative content of microelements of the saliva as an indicator of the severity of electrochemical reactions).

2. Determination of the pH of the saliva (shifting to the alkaline side increases electrochemical activity, while shifting to the acidic side decreases it).

3. Determination of the potential difference of metal inclusions and construction of a series of electrochemical activity: in dentistry, the most informative and appropriate is considered to be measuring the potential of each metal prosthesis; then, based on the measurement data, the

potential difference between them is determined and indirectly judge the possibility of developing galvanosis. This technique also allows you to construct a series of prosthesis activity and identify the most chemically active structures that need to be replaced.

4. Measuring the highest current strength between metal dentures.
5. Hygienic assessment of prostheses and the state of the oral cavity (metal prostheses affect the body through one of the mechanisms - corrosion, which depends on the environment in the oral cavity).
6. Scarification-film test.
7. Leukopenic test; platelet test; determination of the salivary enzyme activity.
8. Immunological tests.
9. Selection of the body's sensitivity to construction materials: according to R. Voll, using pulsed complex-modulated fields.
10. Determination of energy metabolism indicators in the blood (lactic acid and uric acid).
11. Determination of lipid peroxidation indicators in the blood and saliva.

Devices for measuring various parameters of the galvanic element of the oral cavity:

- laboratory pH-millivoltmeter;
- microammeter;
- biopotentiometer BPM-03.

The microcurrent values that arise between gold bridge prostheses in practically healthy individuals are accepted as the norm - they range from 1 to 3 μA (up to 50 mV). With galvanosis, the current strength increases. Indirectly, the possibility of pathological influence of prostheses through the formation of a potential difference between them can be judged by measuring the potential difference with a voltmeter with a high internal resistance of the device of 10 kilo-ohms and higher. For greater accuracy of measurement of readings and detection of more active orthopedic structures, it is necessary to use reference electrodes that have a stable potential. For this purpose, a silver chloride reference electrode can be used, the intrinsic potential of which is 220 mV. Orthopedic structures with a more electronegative potential, or prostheses with a potential of over minus 220 mV are considered subject to replacement.

Skin tests for nickel, chromium, and cobalt are negative during galvanosis. Microelements in saliva are determined by spectral analysis. A quartz spectrograph ISP-28 is used.

To assess the significance of electrochemical potentials of prostheses and their difference in the etiopathogenesis of intolerance, it is necessary to assess the functional state of the receptor apparatus of the oral cavity. For this purpose, various research methods are used:

1. Determination of tactile and pain sensitivity.
2. Determination of the threshold sensitivity of the oral mucosa to electric current (method of V.S. Onishchenko).

The final diagnosis is based on:

1. Measuring the electrochemical potentials of the prostheses.
2. Determining the maximum potential difference between the structures.
3. If the electrochemical potential difference is less than 74 mV, then in 95% of cases it is necessary to make a diagnosis of paresthesia.
4. If the electrochemical potential difference is greater than 74 mV, then the diagnosis is galvanosis.

DIFFERENTIAL DIAGNOSTICS

Differential diagnostics must be carried out with allergies to metals included in the alloys, oral candidiasis, glossalgia, and glossadynia.

Differential diagnostics of intolerance to metal dentures:

1. Skin allergy testing with salts of metals included in the alloys.
2. Blast transformation reaction of lymphocytes.
3. Mast cell degranulation reaction.
4. Immunophenotyping of markers of early activation of T- and B-lymphocytes.
5. Measuring electrochemical potentials of metal prostheses.

6. Detection of a potential difference between prostheses of more than 70 mV.
7. The presence of more than two metal inclusions in the oral cavity.
8. History of diseases of the gastrointestinal tract, central and peripheral nervous system.
9. High sensitivity of the oral mucosa to electric current.
10. Positive results of bacterial culture for Candida fungi.

Scheme of differential diagnostics of intolerance to metal dentures

	1	2	3	4	5	6	7	8	9	10
galvanoses					±	+	±	+	±	
allergies	+	+	+	+						
candidiasis					±	±	±	±	±	+
glossodynia									+	

Methods of orthopedic treatment:

1. Elimination therapy (removal of metal dentures from the oral cavity and repeated prosthetics is performed when the possibilities of other treatment methods and effects on the immune system have been exhausted).

Removal of metal dentures should be preceded by their thorough examination for compliance with generally accepted standards and a study of their galvanic status, which includes:

- the value of the electrochemical potential of all available metal dentures (this value is typical for each alloy and should be no more than -220 mV);
- the potential difference between them should not exceed 70-74 mV (for a healthy person).

2. General and local effects on the immune system (immune system stimulants of general and local action of the tripeptide glutathione - acetylcysteine 600 mg once a day for 21 days; rapin and T-activin locally, as well as anti-inflammatory and desensitizing therapy).

3. Rational prosthetics from selected metal alloys:

- exclusion of dissimilar metals in the structures of dental prostheses;
- refusal of stamped and soldered structures;
- careful observance of technologies for the manufacturing dental prostheses (in order to reduce the electrochemical potential of new prostheses, it is proposed to carry out their electrolytic treatment in a 2% solution of potassium salts (sulfate, carbonate, phosphate) for 10 minutes).
- polishing of metal parts of prostheses according to GOST;
- timely replacement of dental prostheses.

4. Screening of metal structures (use of ceramic masses, photopolymers, acrylic plastics, manufacture of fixed prostheses without a metal "garland").

5. Use of metal-free ceramics.

Possible errors in orthopedic treatment:

1. Irrational designs of dentures containing metal inclusions.
2. Orthopedic treatment against the background of inflammatory phenomena or diseases of the oral mucosa.
3. Violation of the technology for manufacturing dentures.
4. The patient has not been explained the rules for caring for dentures.

Possible complications of orthopedic treatment:

1. Formation of a galvanic pair as a result of using dissimilar metals or soldering of denture parts.

2. Relapse of the disease due to incomplete replacement of all metal inclusions in the oral cavity.

3. Relapse of allergic reactions to metal inclusions.

Rehabilitation and preventive measures:

1. Compliance with hygienic rules for caring for dentures.

2. Timely replacement of dentures.

3. Preferably making cast structures.

4. Repeated prosthetics using noble alloys in the presence of dentures made of similar alloys in the oral cavity.

SITUATIONAL TASKS

1. Patient S., 45, came to the orthopedic dentistry clinic complaining of a burning sensation in the mouth and a metallic taste. According to the patient, metal-ceramic bridge prostheses were made for her upper jaw about 2 months ago. Examination of the oral cavity revealed: metal-ceramic bridge prostheses on the upper jaw with supports on teeth 18, 14 and 23, 26, as well as a stamped and soldered bridge prosthesis made of gold alloy on the lower jaw with supports on teeth 34, 37, made more than 20 years ago.

What additional research methods should be carried out to make a diagnosis? What is the doctor's tactics?

2. Patient T., 43, came to the orthopedic dentistry clinic complaining of dryness of the oral mucosa, a burning sensation in the area of the bridge prosthesis on the lower jaw, made about 1 year ago. Objectively: stamped and soldered bridge prosthesis on the lower jaw with supports on teeth 33, 34, 37 with a violation of the integrity of the titanium nitride coating, a greenish color of the soldering zones of the prosthesis elements. The gums in the area of teeth 33 and 34 are hyperemic, in the area of tooth 37, pronounced necrosis of the gingival papillae is noted. There are no other metal inclusions in the oral cavity. What is the cause of the developed pathological changes? What is the doctor's tactics?

3. Patient M., 29 years old, after the examination, was recommended to make a metal-ceramic bridge prosthesis with supports on teeth 13 and 16 to restore the extracted teeth 14, 15. There are no other prosthetic structures in the oral cavity, there are amalgam fillings in teeth 17, 18, all other fillings in natural teeth are made of composites and glass ionomer cement. What recommendations should be given to the patient before the manufacture of dentures for the prevention of galvanosis?

4. Patient A., 45 years old, complains of a burning sensation and sour taste in the mouth. According to the patient, the complaints appeared several days after the temporary fixation of a metal-ceramic bridge prosthesis supported by teeth 23 and 26. Upon examination of the oral cavity: the prosthesis supported by teeth 23, 26 meets all quality criteria, there is also a metal-ceramic bridge prosthesis supported by teeth 34, 35 and 37, made about 5 years ago. According to the patient, this prosthesis did not cause discomfort. What additional research methods should be carried out to make a diagnosis? What is the doctor's tactics?

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.

3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 12

Subject: Pathological changes in the condition of the body, tissues and organs of the oral cavity associated with the presence of dentures. Allergies. Etiology, pathogenesis, clinical manifestations, prevention, treatment methods.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to study the etiological factors, pathogenesis and clinical picture of allergic reactions to denture materials, to teach students methods of diagnosis, treatment and prevention of oral diseases caused by allergic reactions to denture materials.

Objectives of the lesson:

1. To master the skills of objective examination of the organs and tissues of the oral cavity in patients with allergic reactions.
2. To study diseases with a similar clinical picture.
3. To consider the criteria that orthopedic structures must meet.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: control survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from human anatomy: structure of the oral mucosa, innervation of the maxillofacial region, features of blood supply;
- from general dentistry: materials science and laboratory technology for making prostheses.

Control questions from related disciplines:

1. Anatomical and physiological features of the structure of the oral mucosa.
2. Noble and base metals and metal alloys in dentistry. Composition, properties.
3. Characteristics of acrylic plastics used in orthopedic dentistry.

4. Clinical and laboratory stages of manufacturing fixed and removable dentures.

Control questions:

1. Allergic reactions, types, stages of development, mechanism of development.
2. Epidemiology of allergic reactions to components of dental materials.
3. Etiology, pathogenesis, clinical picture of allergic conditions of the oral cavity.
4. Diagnostics (clinical and laboratory) of allergic reactions to materials of dentures.
5. Methods of treatment of allergic reactions to materials of dentures.
6. Prevention of diseases of the oral cavity caused by allergic reactions.

More than 100 years have passed since the time (1906) when the Austrian pediatrician Clemens von Pirquet (1874-1929) first proposed the use of the term “allergy” to denote an abnormal, altered reactivity of the body in response to the influence of various environmental factors. The term “allergy” comes from two Greek words ἄλλος (allos – different) and ἔργον (ergon – action), and is translated as a different, altered reaction.

ALLERGY is a manifestation of increased sensitivity of the body's immune system to an allergen (antigen) upon repeated contact with it.

INTOLERANCE is a broader concept that includes the entire symptom complex of pathological reactions of various origins.

A.D. Ado in his monograph “General Allergology” (1978) identified three stages of development of allergic reactions:

IMMUNOLOGICAL STAGE – lasts from the moment of primary contact of the immune system with the allergen until the development of sensitization of the body;

PATOCHEMICAL STAGE – develops with repeated contact of the immune system with a specific allergen and is characterized by the release of a large number of biologically active substances;

PATHOPHYSIOLOGICAL STAGE – is characterized by a disruption in the functioning of cells and tissues of the body up to their damage under the influence of biologically active substances released by the immune system during the pathochemical stage.

The clinical stage completes the pathophysiological stage and is its clinical manifestation.

ALLERGEN – is an antigen of a certain type that causes sensitization in an organism sensitive to it.

An **ALLERGEN** can be almost any substance of protein or non-protein, organic or inorganic nature.

Antigens that cause a full immune response are called complete antigens. These are organic substances, usually of microbial, plant and animal origin. Chemical elements, simple and complex inorganic compounds do not have antigenicity, but acquire this ability when conjugated with high-molecular protein carriers or in a mixture with them. Such substances are called incomplete antigens, or **HAPTENS**.

The molecular weight of the antigen is of great importance. Biopolymers with a molecular weight of at least 5-10 kD have antigenicity.

HAPTENS, due to their small molecular weight, are not fixed by immunocompetent cells of the macroorganism and cannot cause an immunological response. If a hapten molecule is artificially enlarged by conjugating it with a large protein molecule, a complete antigen will be obtained, the specificity of which will be determined by the hapten. Most degradation products of dental prosthesis materials are not complete antigens. **BIODEGRADATION** is the process of destruction of materials in the biological environment of the body.

MAIN MECHANISMS OF BIODEGRADATION

Of dental alloys	Of polymer materials
❖ corrosion, ❖ mechanical wear.	❖ dissolution, ❖ mechanical wear,

❖ microbial destruction.

The biological environment of the oral cavity creates ideal conditions for the biodegradation of dental materials included in dental prostheses:

- multiple pH fluctuations over wide limits;
- constant fluctuations in ambient temperature;
- mechanical wear of materials;
- exposure to components of food products and medicines;
- interaction of materials of different compositions with each other;
- exposure to oral bacteria and their metabolic product.

SOME PRODUCTS OF BIODEGRADATION OF DENTAL MATERIALS

<u>INORGANIC COMPOUNDS:</u>		<u>ORGANIC COMPOUNDS:</u>	
Biodegradation products of dental alloys and solders: ✓ argentum ✓ aurum ✓ cobalt ✓ chromium ✓ ferrum ✓ magnesium ✓ manganese ✓ nickel ✓ palladium ✓ platinum ✓ etc.	Biodegradation products of inorganic components of filling materials and ceramic masses: ✓ boron ✓ fluorine ✓ sodium ✓ magnesium ✓ aluminum ✓ silicon ✓ potassium ✓ zinc ✓ strontium ✓ zirconium ✓ tin ✓ cesium ✓ barium ✓ cerium ✓ etc.	Biodegradation products of acrylic plastics: ✓ MMA (residual monomer) ✓ MA (product of MMA degradation) ✓ EGDMA (crosslinking agent) ✓ Other monomers ✓ phenyl benzoate (initiator degradation product) ✓ phenyl salicylate (initiator degradation product) ✓ phthalates ✓ formaldehyde (MMA degradation product) ✓ etc.	Biodegradation products of polymer filling materials: остаточные мономеры: - Bis-GMA, - UDMA, - TEGDMA, - HEMA, - MMA, - etc. ✓ initiators ✓ photoinitiators ✓ accelerators ✓ etc. The interaction products of the above compounds: ✓ bisphenol A ✓ ethylene glycol ✓ etc.

Types of allergic reactions

Classification P.Gell u R.Coombs (1969 г.) indicates 4 types of reactions:

	<i>I-type</i> <i>Anaphylactic</i> IMMEDIATE <i>TYPE</i>	<i>II-type</i> <i>Cytotoxic</i> IMMEDIATE <i>TYPE</i>	<i>III-type</i> <i>Immune complex</i> IMMEDIATE <i>TYPE</i>	<i>IV-type</i> <i>Cellular</i> SLOW <i>TYPE</i>
Antibodies	IgE	IgG, IgM	IgG, IgM	-
Antigens	Exogenous	Components of cellular membrane	soluble	Haptens, Organs/Tissues
Realization time	15-30 minutes	minutes-hours	3-8 hours	48-72 hours
Manifestations	Edema	Lysis and Necrosis	Erythema, Edema, Necrosis	Erythema and Infiltration
Histology	Basophils and Eosinophils	Antibodies and Complement	Complement and Neutrophils	Monocytes and Lymphocytes
Examples	Anaphylaxis, asthma, rhinitis, Quincke's edema, etc.	Hemolytic anemia, autoimmune thyroiditis, etc.	Serum sickness, drug and food allergies, etc	Allergic contact dermatitis, transplant rejection reaction

The results of most studies indicate that the main mechanism for the implementation of local reactions of the oral cavity to dental prosthesis materials are type IV reactions (delayed hypersensitivity). Single observations indicate the possibility of forming immediate hypersensitivity reactions of type I to Ni and Hg ions, type II to Au and Hg, and type III to Au and Ni.

MECHANISM OF IMPLEMENTATION OF TYPE IV ALLERGIC REACTIONS

- ✓ Biodegradation products of dental materials (haptens), interacting with carrier molecules (proteins, carbohydrates, nucleic acids, etc.) are transformed into complex allergens.
- ✓ Complexes are captured by antigen-presenting cells (Langerhans cells), the specific gravity of which in the oral mucosa is from 2 to 15% of the cellular composition.
- ✓ As a result of intracellular processing of complex antigens, peptides that fix the hapten bind to class II recognition molecules (HLA-II) and the formed complex is exposed on the APC membrane for subsequent presentation to CD4 T-lymphocytes.
- ✓ Presentation of foreign antigen is carried out in the paracortical zones (T-cell) of regional lymph nodes.
- ✓ These interactions lead to clonal proliferation of effector T-lymphocytes (CD4 and CD8) and the formation of T-cell memory, which are responsible for the development of an allergic reaction upon repeated contact of the body with the antigen.
- ✓ The process takes 10-14 days.
- ✓ During repeated contact of the body with the hapten, the development of clinical manifestations requires the formation of a full-fledged allergen.
- ✓ Complexes are captured by Langerhans cells (antigen-presenting cells).
- ✓ Langerhans cells process antigens and present them to sensitized T-lymphocytes located in the tissues.
- ✓ Activated T-lymphocytes (CD4 and CD8) accumulate in the tissues of the oral mucosa and produce an excess of pro-inflammatory cytokines (INF- γ , IL-2, FNO-a, etc.), activating poly- and mononuclear phagocytes, which release a number of enzymes that damage connective tissue.
- ✓ Proinflammatory cytokines initiate the development of inflammation, maintain its high activity, cause increased vascular permeability, etc.
- ✓ From the time of formation of full-fledged allergens to the appearance of clinical manifestations, 48-72 hours pass.

DIAGNOSTICS OF ALLERGIC REACTIONS

The following signs serve as reliable diagnostic criteria for allergic reactions to components of dental materials:

establishment of a clear cause-and-effect relationship between the fact of dental prosthetics and the appearance of clinical symptoms;

aggravated allergy history;

alleviation or complete disappearance of symptoms after elimination of the causal structures; exclusion of other types of negative impact on the organs and tissues of the oral cavity (design and technological deficiencies of prostheses, toxic effects);

exclusion of local and general pathology with similar symptoms;

positive results of allergological and immunological methods.

*RELATIONSHIP BETWEEN THE DIAGNOSIS OF ALLERGIC REACTIONS AND THE
MECHANISM OF THEIR CLINICAL MANIFESTATIONS*

REACTION TYPE	MECHANISM	CLINIC	IN VIVO & IN VITRO diagnostics
I-type anaphylactic	IgE	Shock, urticaria, Quincke's edema, etc.	Determination of IgE in blood serum and fixed basophils. Skin, sublingual and other tests.
II-тип cytotoxic	IgG, IgM	Hemolytic anemia, etc.	Determination of IgG, IgM specific antibodies in blood serum..
III-тип immunocomplex	IgG, IgM, ИК	Serum disease, vasculitis, etc.	Determination of IgG, IgM, detection of IC. Skin and other tests.
IV-тип cellular (delayed hypersensitivity)	T-lymphocytes	Contact allergy, etc.	Detection of immune T- lymphocytes. Cytokine analysis. Skin tests.

WHEN COLLECTING AN ALLERGIC HISTORY, IT IS NECESSARY TO CLARIFY

- ✓ results of previously performed dental prosthetics and dental treatment,
- ✓ types of previously used prosthetic designs and materials,
- ✓ presence of general pathology,
- ✓ presence of allergic diseases,
- ✓ the body's reaction to vaccinations,
- ✓ presence of occupational hazards,
- ✓ presence of bad habits,
- ✓ diet,
- ✓ range of medications used,
- ✓ presence of similar pathology in relatives,
- ✓ results of previously performed treatment and preventive procedures,
- ✓ etc.

KEY FACTS OF ALLERGY HISTORY

- ✓ the appearance of negative symptoms upon contact at the workplace (tools, chemicals, etc.) and at home with metals (jewelry, costume jewelry, buttons, eyeglass frames, bracelets, etc.) and polymers;
- ✓ the presence of a clear cause-and-effect relationship between the appearance of the corresponding symptoms and previous dental prosthetics;
- ✓ alleviation or complete disappearance of symptoms after the elimination of the causal structures.

ALLERGY HISTORY II SURVEY

With the help of a questionnaire specially developed at the Department of Orthopedic Dentistry of the Belarusian State Medical University [P.N. Moiseychik, L.S. Velichko - 2000], it is possible to study the prevalence and clinical nature of allergies to components of dental prosthetics materials, to determine the most probable risk factors for the development of an allergic reaction during dental prosthetics.

Based on the study of questionnaire data of patients with the allergic anamnesis, it is possible to generalize and create a special map, on the basis of which it is possible to predict possible allergic reactions in patients, which allows for their targeted examination to clarify the

possible presence of sensitization to certain components in the composition of materials used for dental prosthetics. For this, all patients are divided into two large groups - populations:

A - population with a history without allergies;

B - population with an allergy anamnesis.

The first group of patients does not require a special in-depth allergological examination. The second is a risk group, subject to special allergological examination. The latter can be divided into almost three subgroups, in which the most predisposed to various allergic reactions are patients with the allergy history to haptens (medicines, chemicals and food substances).

Clinical characteristics of patients and features of allergic reactions during prosthetics

In individuals with a predisposition to allergic reactions, the nature of clinical manifestations depends on the number of dental prosthetics units and the composition of the material used for dental prosthetics.

Based on the number of prostheses in the oral cavity, patients should be divided into the following subgroups: 1) patients with single steel crowns in the oral cavity; 2) patients with steel bridge prostheses; 3) patients with chromium-nickel steel bridge prostheses with plastic lining; 4) patients with bridge prostheses with titanium nitride coating, including patients with titanium coating and plastic lining.

Based on the severity of allergic reactions, they are divided into weak, strong and false allergic.

Weak allergic reactions are more often observed in patients of the second group. They are noted mainly by local reactions in the oral cavity. Patients of the third and fourth groups with pronounced allergic reactions have the following symptoms: burning of the mouth, increased salivation with hyperemia, edema and the presence of erosive changes in the mucous membranes, polysystemic reactions (Quincke's edema, dermatitis, itching of the eyelids).

False allergic reactions in patients of the first group. In individuals with false allergic reactions, various complaints from the oral cavity prevail without any specific changes in the mucous membrane and with negative mast cell degranulation reaction and leukocyte migration inhibition reaction, in the presence of autonomic dysfunction and the presence of such complaints as dizziness, headache, sleep disturbance, irritability, cancerophobia.

Also patients may experience allergic manifestations at work with constant contact with metal dust in factory shops or with chemical reagents. It should be noted that in the presence of a professional allergy anamnesis, rational employment of these patients leads to the disappearance of both complaints and changes in the oral mucosa.

The formation and severity of allergic reactions depend on the combined effect of haptens, i.e. weak allergic reactions at the initial stage of prosthetics are transformed into pronounced ones, with a combined effect of haptens, in the presence of strong sensitizers (with a high hazard class), with a combination of chromium with nickel, chromium with titanium, cobalt with titanium, as well as a combination of these groups with other elements.

Weak allergic reactions can be transformed into more pronounced ones upon contact with weak sensitizers - gold, in cases of an increase in the number of units of the product in the oral cavity (an increase in the concentration of the allergen).

COMPLAINTS (SUBJECTIVE SYMPTOMS)

A typical complaint of patients is swelling of the mucous membranes of the cheeks, tongue, lips, soft palate and pharynx. Due to the swelling, there is difficulty in swallowing, sometimes breathing, the tongue does not fit in the mouth, causes discomfort, patients bite their cheeks and tongue. Burning of the tongue is the most common complaint of patients with an allergy to metal dentures. The burning is constant, intensifying when taking plant, sour food, in the evening, at night. The symptom of burning of the tongue in allergic stomatitis to metals must be differentiated from other diseases accompanied by symptoms of burning of the tongue. Patients are also bothered by a feeling of dry mouth, unbearable thirst, impaired salivation (hyposalivation, sometimes clearly expressed xerostomia). Dryness in the nose and throat may join the symptom

of dry mouth. Allergic stomatitis caused by dentures made of metal alloys (chromium-cobalt, stainless steel) is accompanied by a change in taste sensitivity (taste of metal, acid). The sense of taste is caused by the effect of chemical agents on the perceiving organs of the tongue, i.e. taste buds. The latter are small oval or round formations immersed in the multilayered flat epithelium of the tongue and opening with a small taste duct. Taste buds are located not only over the entire surface of the tongue, but also on the arches, tonsils, and mucous membrane of the cheeks. In taste buds, taste cells are distinguished, to which the non-pulpable fibers of the glossopharyngeal nerve approach, which are intermediaries in the transmission of sensations. Taste buds are located in the foliate and fungiform papillae of the tongue. The same substance in different places of the tongue gives different taste sensations. The irritation threshold depends on the size of the irritated surface, the duration of exposure, the state of the nervous system, etc. The sour sensation, the taste of metal are associated with H-ions appearing in saliva as a result of electrochemical reactions, the alkaline taste - with OH-ions, salty - with free anions with the simultaneous action of cations, causing a sweet or bitter taste.

With intolerance to acrylic plastics, patients often complain of the impossibility or difficulty of using removable dentures due to a constant burning sensation in the mucous membrane of the prosthetic field, expressed more on the upper jaw than on the lower. Sometimes a burning sensation of the tongue, mucous membranes of the alveolar processes, cheeks, lips is added.

Common symptoms may include dysfunctions of the nervous system - irritability, insomnia, emotional lability, cancerophobia, prosopalgia. Exacerbation of chronic cholecystitis, gastritis, colitis is noted. Some patients have "no" general symptoms but very pronounced clinical symptoms in the oral cavity.

COMMON COMPLAINTS:	LOCAL COMPLAINTS:
❖ <i>increased fatigue;</i> ❖ <i>general weakness;</i> ❖ <i>headaches;</i> ❖ <i>joint pain;</i> ❖ <i>gastrointestinal problems;</i> ❖ <i>etc.</i>	❖ <i>burning mouth syndrome (BMS) – R20.850 according to ICD-10 (contact allergy may play a role among the etiological factors. It has no clinical manifestations);</i> ❖ <i>metallic taste in the mouth (is a sign of high activity of the corrosion process of metal dentures);</i> ❖ <i>sensation of electric discharges (is a sign of the presence of a galvanic element in the mouth formed by dissimilar alloys);</i> ❖ <i>dryness of the oral mucosa;</i> ❖ <i>change in taste sensitivity;</i> ❖ <i>paresthesia;</i> ❖ <i>etc.</i>

Most people with this pathology are aged 50-59 and use removable and fixed dentures. A significant proportion of patients are women in the pre- and postmenopausal period. In particular, Burning Mouth Syndrome is diagnosed in women 7 times more often than in men. The above complaints are quite difficult to reliably associate with the pathogenesis of allergic reactions to denture materials. A number of common diseases and conditions of the body, alimentary disorders, and medication intake may be accompanied by similar complaints. More than half of the patients in this group do not show any pathological changes in the organs and tissues of the oral cavity during clinical examination.

*CLINICAL PICTURE OF ALLERGIC MANIFESTATIONS TO COMPONENTS OF
DENTAL MATERIALS IN THE ORAL CAVITY
(OBJECTIVE SYMPTOMATICS)*

On examination, changes in the oral cavity are characterized by diffuse hyperemia of all mucous membranes, sometimes the pharynx, and the red border of the lips. Often, against the background of hyperemia, eroded areas are observed on the cheeks, tongue, and floor of the oral cavity. Petechial hemorrhages are noted on the mucous membrane of the soft palate. Edema of the mucous membranes of the cheeks, lips, and tongue is also characteristic. There are imprints of teeth on the lateral surfaces of the tongue and the mucous membrane of the cheeks. Saliva is viscous, sometimes foamy. The tongue is coated, enlarged, hyperemic, there may be anomalies in the structure of the tongue (geographical, folded tongue). Inflammatory processes (gingivitis, stomatitis) are noted, localized areas of dentures not associated with the action of plaque bacteria and design flaws in the dentures themselves. Metal dentures are discolored, there are oxide films, pores, roughness, etc. Frequent breakages of bridge prostheses at the soldering points are caused by corrosion processes between dissimilar metals.

It should be noted that allergic stomatitis caused by metal dentures is recurrent: it often occurs after repeated prosthetics, less often in patients who have received metal dentures for the first time.

A feature of the course of an allergic disease to metals is the relatively rapid resolution of the inflammatory process after the timely removal of metal dentures from the oral cavity.

Allergic stomatitis to acrylic dentures is somewhat different from stomatitis to metals and is often accompanied by pathology of the mucous membranes of the oral cavity, as well as skin (dermatitis, eczema, urticaria, Quincke's edema). Complaints about the impossibility or difficulty of using removable dentures due to a constant burning sensation in the mucous membrane of the denture field, expressed more on the upper jaw than on the lower jaw, are typical. Sometimes a burning sensation of the tongue, mucous membranes of the alveolar processes, cheeks, and lips is added.

Clinical picture of allergic stomatitis caused by a plastic denture. The mucous membrane of the palate looks like granulated bright red shiny inflammatory foci, sharply outlined along the contour, and in shape and size exactly corresponding to the size of the prosthesis. Inflammation that arose as a result of mechanical action does not have such a clearly expressed form. It depends on the degree of mechanical action. Based on this difference alone, conclusions can be drawn about the cause of the inflammation. It should be emphasized that mechanical action is a contributing, preparatory factor, as it improves the absorption of allergens. In addition, metabolism is disrupted in the inflammation site, which also contributes to the development of an allergic disease to acrylic dentures. Inflammation under the base of a removable denture is accompanied by edema and pronounced hyperemia. Sometimes the inflammation spreads beyond the prosthetic field to areas of the mucous membrane of the lips, cheeks, and back of the tongue, which are in contact with the outer surface of the dentures. Mechanical irritation by the prosthesis aggravates the picture of allergic inflammation, and against the background of the red, loosened mucous membrane of the prosthetic field, structural changes of a hypertrophic nature can be detected: small villous-like papillomatous growths, large fungiform solitary papillomas, sometimes angular cheilitis in the corners of the mouth. In some cases, no objective signs of inflammation are observed.

For patients with allergic stomatitis who use removable dentures made of acrylic plastic, other allergic reactions are also characteristic: reddening of the skin, increased body temperature (37 - 37.4 ° C), acute dermatitis of the face, hands, dyspepsia, burning sensation in the stomach, chronic rhinitis, conjunctivitis, etc.

Patients associate the appearance of these reactions with plastic dentures. Removal of the dentures, as a rule, causes an improvement in the condition; when the denture is inserted into the oral cavity, the clinical picture of the disease reappears. It should be noted that allergic reactions to acrylates that occur outside the oral cavity occur when the body's reactivity is altered.

ALLERGIC TESTING

Allergological testing is practically a mandatory stage for persons of the second and third subgroups of the second group and is especially relevant for repeated prosthetics. It allows the dentist to be guided as to what materials can be used for prosthetics. The neutrophil migration inhibition reaction (NMIR) proposed by Ado A.D., Bondareva is a kind of provocative test in dental practice, since it is based on the contact of the “shock organ” - the oral mucosa with the suspected allergen.

It should be noted that positive or sharply positive NMIR is most often observed for titanium, less often such a reaction is noted for such haptens as chromium, nickel, cobalt, copper, zinc, acrylic. Less often, positive reactions are noted for manganese, magnesium, palladium, silver and gold. Along with NMIR, the same patients should be examined with the above haptens using MCDR (mast cell destruction reaction).

In general, this reaction reveals the same pattern in patient sensitization as the "rinse test" (NMIR).

Most often, positive reactions of mast cell destruction are observed for titanium, copper, zinc, cobalt, acrylic, nickel, chromium, manganese. Less often, positive reactions are recorded for noble metals - gold and silver. It should be noted that MCDR and NMIR in some patients are simultaneously positive for several haptens. A pattern is revealed: the number of positive MCDR in predisposed individuals clearly increases with the combined effect of such haptens as titanium, copper, chromium, nickel, manganese, palladium, and acrylic. Determination of specific antibodies using ELISA can clarify or confirm sensitization to a particular hapten.

If it is not possible to conduct NMIR, a sublingual test with the suspected hapten, a component of the denture, is offered instead.

Considering that most reactions to denture materials are realized as delayed-type allergic reactions, the most relevant are allergological tests for diagnosing type IV reactions.

1. Skin allergy testing

Skin allergy testing has a number of undeniable advantages: such tests are easy to perform, relatively inexpensive and do not require expensive equipment, the results can be obtained in a relatively short period of time (24-48 hours).

Due to these qualities, skin allergy testing is currently the de facto “gold standard” for diagnosing type IV contact reactions.

However, a number of factors do not allow us considering the results of skin testing to be absolutely reliable:

- there is a possibility of a subjective approach to evaluating the results;
- false positive reactions are possible, which are caused by the presence of test substances that irritate the skin;
- in some cases it is not possible to use substances similar in chemical structure to the products of biodegradation of dental materials as a test substance;
- the structure of the oral mucosa differs from the structure of the skin;
- active substances of test substances have much greater bioavailability than the components of the material in the composition of dentures;
- skin tests, being provocative diagnostic methods, can lead to the development of sensitization of the body or to the appearance of a clinical reaction in sensitized patients.

2. Laboratory diagnostics

The presence of sensitized T-lymphocytes can be identified by the following signs:

- change in the spectrum of produced cytokines;
- increased proliferation of T-cells upon stimulation with an allergen;
- expression of activation molecules - markers (CD25, CD69, CD71, etc.).

Lymphocyte blast transformation reaction, LTT is based on the phenomenon of lymphocyte proliferation in response to stimulation with allergens. Lymphocyte proliferation is determined by DNA replication, which is labeled with radioactive or fluorescent labels. Subsequently, the proliferation factor (stimulation index) is calculated.

A modification of lymphocyte blast transformation reaction is the commercial MELISA (Memory Lymphocyte Immunostimulation Assay) test. The ELIsot (Enzyme-Linked Immunospot) and ELISA (Enzyme-Linked Immunosorbent Assay) methods are types of ELISA (enzyme-linked immunosorbent assay) and allow to evaluate the nature of the T-cell immune response by the production of allergen-specific cytokines (INF- γ , IL-2, IL-4, etc.) in response to stimulation of T-lymphocytes by an allergen.

- the practical implementation of such methods requires a well-equipped laboratory, highly qualified personnel and a sufficiently large amount of time (conducting a MELISA test for 15 antigens requires 10 days) and resources;
- for allergens of different structures, the sensitivity of these methods can vary greatly, the diagnostic criteria of the methods are still under development;
- currently, none of the laboratory methods is a standard for diagnosing type IV allergic reactions.

IMMUNOLOGICAL HOMEOSTASIS AND IMMUNOCORREGULATION THERAPY

The study of the state of immunological homeostasis in patients is necessary in order to exclude immunodeficiency, which is important when conducting complex and immunomodulating therapy.

The need for such studies is dictated by the fact that it is difficult to achieve complete elimination of stomatitis manifestations in individual patients, despite the selection of materials for dental prosthetics.

Various deviations from the immunological homeostasis are recorded in most of the examined patients. Some of them have phenomena in the form of hyperproliferative reactions from cellular (increase in total T-lymphocytes, T-helpers) and humoral immunity (increase in IgG and IgM) in response to the presence of a prosthesis in the oral cavity. Others have changes that could be regarded as a suppressive reaction associated with a decrease in the number of T-helpers and immunoglobulins A. Immunoglobulins A, as known, play an important role in the formation of local immunity. This shift should be assessed as a transient form of immunodeficiency, which is corrected together with a doctor - immunologist against the background of the selection of non-allergenic materials for prosthetics.

A very important stage in complex therapy is compliance with the correct sanitary and hygienic regime - oral care, selection of the appropriate medicinal paste, brush for oral care. This significantly contributes to the restoration of local immunity, normalization of IgA.

As for patients who have elevated specific immunoglobulins E, determined by ELISA (to hexavalent chromium and titanium), the clinical manifestations of stomatitis are corrected only after the complete elimination of the allergen. Dentures containing haptens are removed from the oral cavity, household contact with these allergens is limited by following a hypoallergenic diet and excluding from household utensils dishes that can be a source of sensitization (chromium-containing).

FEATURES OF PROSTHETICS AND SELECTION OF MATERIALS

Using patient examination cards and allergy testing data, it is possible to select the most suitable alloys for treating patients. Repeated dental prosthetics should be performed after 2-3 months, after eliminating elements that can support sensitization of the body. At the same time, prosthetics with dissimilar alloys should be avoided.

For the correction and treatment of patients with allergic and pseudo-allergic reactions, in whose oral cavity there was a large number of dental prosthetic units (from 10 to 18), complex therapy is required.

Patients with concomitant general somatic diseases should be recommended systematic preventive treatment by appropriate specialists, sanitation of foci of infection, oral hygiene and a healthy lifestyle. Conduct observation and treatment by an allergist of patients in the presence of other allergic diseases not associated with dental prostheses.

All patients for whom fixed fitted dental prostheses are made should undergo temporary fixation for 8-10 days. If no side effects occur during this time, then permanent fixation is

performed. Follow-up consultations at the orthopedic dentistry clinic are recommended after 1.5 months and 6 months. However, patients should be warned about the need for a repeat consultation at an earlier date if unpleasant sensations in the oral cavity appear.

From the position of the hazard class of various haptens and their alloys used in prosthetics, it is advisable to recommend chromium-nickel steel prostheses only in cases where a negative reaction to chromium and nickel is observed in allergy testing. For individuals of the first subgroup of the second group (population B), it is advisable to exclude alloys that include or are applied in the form of spraying titanium, even with a negative allergic reaction to titanium.

A limited set of alloys for dental prosthetics complicates the problem of providing orthopedic care to patients with an allergic status.

Thus, patients in need of prosthetics are subject to a comprehensive examination. Along with the questionnaire, many of them need both an allergic and immunological examination, which allows achieving good results in orthopedic dentistry and eliminating various side reactions to the materials used in the manufacture of dentures.

ALTERNATIVES TO CONVENTIONAL CONSTRUCTION MATERIALS:

Materials for the production of fixed dentures	
<i>Base alloys</i>	▪ <i>noble and semi-noble alloys;</i> ▪ <i>cpTi (commercially pure cast titanium);</i> ▪ <i>all-ceramic structures;</i> ▪ <i>non-metallic frameworks based on aluminum oxide or zirconium oxide.</i>
<i>Acrylic plastics</i>	▪ <i>photo-curable polymeric materials;</i> ▪ <i>all-ceramic structures.</i>
Materials for the production of removable dentures	
<i>Acrylic plastics for denture bases</i>	▪ <i>materials – structural analogues of nylon, acetal, polypropylene, etc.;</i> ▪ <i>photocurable base materials;</i> ▪ <i>materials for soft linings based on vinylpolysiloxane</i>

PREVENTION METHODS

(especially relevant for people with the history of allergies)

1. Promptly eliminate all foci of suspected chronic infection in the oral cavity.
2. Perform prosthetics only in the stages of remission of general somatic diseases (especially allergic ones).
3. Remove all roughness in newly installed dentures.
4. Eliminate deficiencies in the occlusal relationships of artificial teeth.
5. Avoid rebasing dentures in the oral cavity.
6. Give preference to dentures made of colorless plastic or with a metal base when making them.
7. If possible, a partial removable plate denture should be replaced with a clasp denture.
8. Observe the polymerization modes of plastic when making removable plate dentures.
9. When making fixed dentures, give preference to noble and semi-noble alloys.
10. Avoid making stamped-soldered prostheses and garlands in metal-ceramic and metal-acrylic prostheses.
11. Avoid using titanium nitride spraying.

SITUATIONAL TASKS

1. Patient M., 45 years old, came to the orthopedic dentistry clinic to replace stamped and soldered gold bridge prostheses with new metal-ceramic prostheses. The patient has a history of allergic dermatitis. What material is advisable to use in the manufacture of new prostheses?

2. Patient E., 52 years old, came with complaints of burning and dryness in the mouth, the patient associates the appearance of complaints with the fixation of stamped and soldered bridge prostheses with a titanium nitride coating 2 months ago. Before this, the patient had never had prosthetics.

What additional research methods should be carried out, what should be clarified from the patient's history? Doctor's tactics.

3. Patient S., 68 years old, came to the orthopedic dentistry clinic with complaints of burning under the base of a complete removable plate denture on the upper jaw. The prosthesis was made 2 weeks ago, before that the patient had been using removable plate dentures for over 15 years, there were no complaints. Objectively: the mucous membrane under the denture on the upper jaw is bright red, hyperemic, on the lower jaw - the mucous membrane is unchanged. When examining the denture of the upper jaw, multiple marble stains are visible in the plastic base, the denture of the lower jaw is of a uniform color without pores. Perform differential diagnostics. Doctor's tactics.

4. Patient O., 35 years old, came to the clinic of orthopedic dentistry with complaints of missing teeth 25, 26. When collecting anamnesis, it turned out that the patient has been suffering from food and household allergies for over 10 years, cannot wear any jewelry made of base metals, has not previously had dentures. Objectively: teeth 25, 26 are missing in the oral cavity. Teeth 24, 27 are intact, without damage to the periodontal tissues. What additional studies should be carried out to formulate a final treatment plan? Doctor's tactics.

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.
3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 13

Subject: Increased tooth abrasion. Etiology, pathogenesis, clinical manifestations, diagnostics and classification.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to teach students the general principles of treatment and medical prevention of increased tooth wear and to master the planning of complex treatment of patients with increased tooth wear according to the clinical protocol of the Ministry of Health of the Republic of Belarus.

Objectives of the lesson:

1. To study the etiology of increased tooth wear.
2. To study the pathogenesis of the development of increased tooth wear.
3. To study the clinical manifestation of increased tooth wear.
4. To study the methods of examining patients with increased tooth wear.
5. To study the classification of increased tooth wear.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: survey, testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from anatomy: anatomical structure of teeth, dental arches and jaws, TMJ;
- from histology: histology of the tooth;
- from general dentistry: new technologies and modern construction materials in the restoration of the crown of the tooth;
- from orthopedic dentistry: defects of the crown of the tooth, the index of destruction of the occlusal surface of the tooth, factors causing defects of the crown of the tooth.

Control questions from related disciplines:

1. Anatomical structure of the upper jaw.
2. Anatomical structure of the lower jaw.

3. Muscles that raise the lower jaw.
4. Muscles that lower the lower jaw.
5. Structure of the periodontium.
6. Structure of the TMJ.

Control questions:

1. Diagnosis of the "increased tooth wear" and its rationale.
2. Etiology of increased tooth wear
3. Methods of examination of patients with increased tooth wear
4. Classification of increased tooth wear.
5. Characteristics of changes in the dental system with increased tooth wear

Increased tooth wear (hereinafter referred to as ITW) is a disease characterized by uneven premature loss of hard dental tissues, combined with functional disorders of the masticatory muscles and temporomandibular joints (hereinafter referred to as TMJ). Increased tooth wear code according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) – K03.0 increased tooth wear.

ITW CLASSIFICATION

According to the clinical protocol “Diagnostics and treatment of patients (adult population) with increased tooth wear” approved by the Resolution of the Ministry of Health of the Republic of Belarus dated 10.08.2022 No. 84, PSD is classified by clinical course and severity.

According to the clinical course, the following are distinguished:

- occlusal ITW - tissue loss in the horizontal plane;
- proximal ITW - vertical abrasion of teeth with loss of enamel on the proximal surfaces of the teeth.

According to the severity, the following are distinguished:

- I degree - abrasion within the enamel on the tubercles or cutting edge without exposure of dentin;
- II degree - the chewing tubercles or cutting edge are completely worn within the dentin;
- III degree - tooth tissue is worn down to the level of the tooth cavity, which is filled with replacement dentin.

According to the stage (M.R. Bushan):

- physiological - within the enamel;
- transitional - within the enamel and partially dentin;
- pathological - within the dentin.

According to the form (A.L. Grozovsky):

- horizontal - palatal or vestibular surfaces;
- vertical – chewing surfaces, cutting edges;
- mixed.

By degree of compensation (E.I. Gavrilov):

- compensated – without reduction in the height of the lower part of the face;
- decompensated – with reduction in the height of the lower part of the face.

By extent (V.Yu. Kurlyandsky):

- localized – wear of individual crowns or a group of teeth;
- generalized.

ITW ETIOLOGY

ITW is polyetiological. Etiological factors causing tooth wear are classified as follows.

1. Functional inferiority of hard dental tissues. It is associated with morphological inferiority of dentin and enamel. It can be:

- hereditary (Capdepont-Stanton syndrome);
- congenital (in case of disorders of amelo- and dentinogenesis caused by diseases of the mother and child);
- acquired (occurs as a result of neurodystrophic processes, disorders of the circulatory system and endocrine apparatus, metabolic disorders of various etiologies).

2. Functional overload of teeth. It occurs:

- with partial loss of teeth (due to increased load on the remaining teeth);
- parafunctions (bruxism, bruxomania, etc.);
- hypertonicity of the masticatory muscles of central origin, as well as hypertonicity associated with the profession (vibration, physical stress);
- chronic dental trauma (including bad habits);
- abnormal bite (for example, with cross, deep, progenic, etc.), as well as with a variety of physiological - direct bite.

3. Professional hazards (acid and alkaline necrosis, dust). Abrasion due to the intake of hydrochloric acid in achylia, as well as pathological abrasion in bulimia. Some researchers associate the early appearance of signs of pathological abrasion with the intake of certain types of food that have an erosive (acidic) effect, for example, carbonated drinks.

V.N. Kopeikin suggests identifying an additional group of factors - excessive abrasive effect of certain materials on hard tissues of teeth. Examples include the impact of hard food (among the Nenets who eat frozen raw fish and meat, the prevalence of pathological abrasion is 70-80%), tooth abrasion due to prolonged use of hard toothbrushes and tooth powder. This group of factors also includes the irrational choice of material for the manufacture of dentures and fillings.

ITW PATHOGENESIS

The areas of the ITW most often have a smooth, polished surface (facets). Less often, cells of various shapes (erosions) are formed along the edge of the anterior teeth or the surface of the occlusion of premolars and molars. The formation of erosions is due to the fact that the process of abrasion of various layers of enamel and dentin occurs unevenly. This process is typical for deep bite, when predominantly vertical movements of the teeth are observed. Often there is a combination of pathological abrasion with hypoplasia and wedge-shaped defects. Worn teeth are characterized by stability and the absence of clinical signs of periodontal diseases. This is explained by a decrease in the lever arm due to shortening of the extra-alveolar part. In most cases, X-ray examination reveals a normal periodontal structure and no signs of bone resorption in the sockets of worn teeth. The periodontal gap is usually not widened. However, if there are conditions for functional overload (bruxism, loss of many teeth, bite anomalies, etc.), bone tissue destruction and expansion of the periodontal gap occur.

The different forms and degrees of expression of occlusal curves quite accurately reflect the individual features of the movement of the lower jaw in each patient. A very important sign of pathological tooth wear is hyperesthesia of enamel and dentin. It does not develop in all patients and can manifest itself in the area of one, several or all teeth.

Generalized pathological abrasion is usually accompanied by a decrease in the interocclusal height and the height of the lower third of the face. The severity of these disorders depends on the depth of abrasion of the hard tissues of the teeth and the type of occlusion, and in the presence of defects in the dental arches - on their size and topography. Pathological abrasion is a chronic process, so the loss of hard tissues of the chewing surface often causes reactive changes in the bone tissue of the alveolar process - vacant hypertrophy. Its severity depends on the individual characteristics of the body, but has an inverse correlation with the rate of development of the pathological process. The faster the decrease in the height of the crowns of the teeth, the lesser the degree of expression of vacant hypertrophy of the alveolar process. In the complete

absence of signs of hypertrophy, when the decrease in the height of the bite is equal to the amount by which the teeth are worn, they speak of a decompensated form of pathological abrasion. This form is most often accompanied by complications from the TMJ and masticatory muscles. In the clinic, one can encounter situations in which vacant hypertrophy of the alveolar process is observed, but at the same time a decrease in the height of the lower part of the face is revealed by some value less than the decrease in the occlusal height, i.e. a subcompensated form. Much less often, generalized pathological abrasion of teeth is not accompanied by a shortening of the lower third of the face. Some of the most severe cases of generalized abrasion of teeth in terms of preparatory treatment and prosthetics are those in which there is no decrease in the interocclusal height (compensated form of pathological abrasion). Despite the fact that the crowns of the teeth can be worn down by half or more, in a state of physiological rest, the interdental space does not exceed 1-2 mm, and in some cases is completely absent. When examining such patients, sharply expressed alveolar processes of the jaws are striking: they are visible when smiling and talking. The clinical picture of the pathology is aggravated in cases where generalized tooth abrasion is complicated by defects of the dental arches and parafunction of the masticatory muscles. With the loss of a large number of antagonist pairs of teeth, the functional load on the remaining teeth increases, which dramatically accelerates the process of abrasion of hard dental tissues and can cause functional overload of the periodontium. The compensated state in the periodontal tissues is maintained under certain conditions (intact dental arches, normal function of the masticatory muscles, high resistance of the periodontal tissues). With a decrease in tissue tolerance, a decompensated state may occur, which leads to destructive changes. A decrease in the interocclusal height and the height of the lower third of the face is often accompanied by parafunction of the masticatory muscles (bruxism), lateral and sagittal displacement of the lower jaw. In this case, a change in the topographic relationships of the TMJ elements occurs. The clinical picture in this case is so complicated that it is often impossible to establish cause-and-effect relationships between the links in the pathogenetic chain (pathological tooth wear – periodontal disease – bruxism – TMJ dysfunction).

Localized abrasion is less common than generalized abrasion and may occur both with intact dentition and with partial tooth loss. The height of the lower third of the face does not decrease, but as the abrasion of a separate group of teeth increases, hypertrophy of this section of the jaw develops, where the abraded teeth remain in occlusal contact with the antagonist teeth. Pathological abrasion of individual teeth caused by bad habits is also possible. Pathological abrasion in bulimia has a characteristic picture. In this case, gastric acid gets mainly on the palatine surface of the upper front teeth. Pathologically changed enamel and dentin look like in erosion (density is not affected, enamel retains shine, tissue pigmentation and hyperesthesia are possible), but differ in the area of the affected surface. Electrical excitability of teeth in pathological abrasion of hard tissues is sharply reduced or completely absent, which indicates deep degenerative changes or pulp necrosis. As already noted, with the abrasion of hard dental tissues, the interocclusal distance and the height of the lower third of the face often decrease. In specialized literature, this condition is called a decreasing bite. The clinical picture of a decreasing bite is very diverse, depends on many factors and can lead to various complications, the most dangerous of which is TMJ dysfunction. However, this complication does not occur in all patients with pathological abrasion and not in all its forms. TMJ dysfunction develops with decompensated generalized abrasion, most often grades II and III, with a combination of pathological abrasion of teeth with defects and deformations of the dentition. The clinical picture of TMJ dysfunction is diverse and depends on various factors: the patient's age, general condition, mental status, type of bite, shape and depth of pathological abrasion of teeth, the state of periodontal tissues. It is often so complex and confusing that it is impossible to establish cause-and-effect relationships. However, despite the complexity of the clinical picture, a clear relationship is revealed between the state of hard dental tissues, periodontal tissues, masticatory muscle tone and TMJ. In the clinical picture of dysfunctional syndrome, a number of characteristic symptoms can be identified: crunching, clicking and pain in the joint, facial, headache and neuralgic pain, fatigue of the masticatory

muscles, muscle pain, displacement of the lower jaw to one side, hearing loss, glossalgia, dry mouth, dizziness. A typical symptom is pain in the joint and masticatory muscles caused by a decrease in the interalveolar height and distal displacement of the articular head in the glenoid fossa. If TMJ dysfunction is accompanied by bruxism, the pain can be diffuse. The second most common symptom of TMJ dysfunction is crunching and clicking in the joint. The degree of their expression may vary: from barely perceptible to loud. Distal displacement of the lower jaw over time leads to parafunction of the masticatory muscles of compensatory origin and the formation of the so-called sliding bite, in which the patient strives to set the lower jaw in the correct position, but at the moment of closing the dental arches, the jaw again moves to the side (habitual occlusion). Due to the complexity of the picture and the varied symptoms, patients often need to be examined by an otolaryngologist, neurologist, therapist and other specialists.

THE MAIN METHODS OF DIAGNOSTICS OF ITW ARE:

- anamnesis collection;
- external examination and palpation of the maxillofacial area;
- examination of the oral cavity using additional instruments, percussion, assessment of the condition of the teeth, dental arches, dentures;
- assessment of the condition of periodontal tissues and oral mucosa;
- index assessment of dental health: hygiene index (Green, Vermillion hygiene index – OHI-S);
- instrumental studies (radiation methods of examination): targeted intraoral contact radiography or orthopantomography of the jaws.

THE SUPPLEMENTARY METHODS OF DIAGNOSTICS OF ITW ARE:

- instrumental examinations (radiological examination methods): cone-beam computed tomography of the maxillofacial region, cone-beam computed tomography of the TMJ;
- index of destruction of the occlusal surface of the tooth; (IDOST)
- use of devices (face bow, HIP analyzer, others) for spatial orientation of the upper jaw model in the articulator and for transmitting the hinge axis of rotation of the lower jaw, with subsequent functional analysis of the dentoalveolar system;
- detection and analysis of excessive occlusal contacts of teeth and artificial dentures (supercontacts);
- functional diagnostic studies (functional tests, electromyography);
- consultation with a specialist doctor for medical indications (dentist-orthodontist, otolaryngologist, endocrinologist, hematologist, cardiologist, gastroenterologist, rheumatologist, neurologist, infectious disease specialist, psychotherapist, psychiatrist-narcologist, allergist-immunologist, radiologist, clinical laboratory diagnostics doctor, physiotherapist, general practitioner and others);
- assessment of the relationship between TMJ complicated by TMJ and masticatory muscle disorders and the general somatic status, as well as clarification of the need for consultation with medical specialists, by filling out a form for examining clinical signs of TMJ dysfunction in TMJ, filling out a preclinical questionnaire for patients with symptoms of TMJ dysfunction in TMJ, filling out the hospital anxiety and depression scale for patients with TMJ and the Holmes-Rague stress event rating scale;
- photography to assess the aesthetics of the smile and face, as well as analysis of the dentomaxillary system;
- determination of the relationship with parafunctional habits; ultrasound methods of TMJ examination (according to medical indications)

. When diagnosing ITW, the general somatic condition of patients is also determined.

First of all, with the identification of pathology that can affect the choice of treatment method (bronchial asthma, epilepsy, endocrine system condition, allergic reactions, etc.), and purposefully identify:

- inadequate psychoemotional state of the patient;
- acute lesions of the oral mucosa and red border of the lips;
- acute inflammatory diseases of the organs and tissues of the mouth;

- periodontal diseases in the acute stage;
- unsatisfactory hygienic condition of the oral cavity;
- desire to be treated or refusal of treatment.

SITUATIONAL TASKS

1. Patient M., 68 years old, complained of difficulty chewing food, aesthetic defect, and painful sensations in the temporomandibular joint on the left. History: teeth 1.6, 1.7, 1.8, 2.6, 2.7, 2.8, 3.8, 4.8, 3.7, 4.7, 3.6, 4.6 were removed more than 10 years ago due to periodontal diseases. She had not sought orthopedic care before. Objectively: Teeth 1.5, 1.4, 1.3, 1.2, 1.1, 2.1, 2.2, 2.3, 2.4, 2.5, 3.5, 3.4, 3.3, 3.2, 3.1, 4.1, 4.2, 4.3, 4.4, 4.5 (IDOST)> 50%), tooth 4.5 has a filling in the cervical area, teeth 1.1, 2.1 have fillings in satisfactory condition. The relationship of the dental arches of the upper and lower jaws is orthognathic. Make a diagnosis. Make a treatment plan.

2. Patient S., 56 years old, complained of difficulty chewing food, aesthetic defect, periodic pain in the temporomandibular joint. History: missing teeth of the upper and lower jaws were removed due to periodontal diseases and complicated caries 1.2 years ago, pain in the joint area has become more intense in the last six months. Objectively: fillings in teeth 1.3, 2.3, 3.6 are in satisfactory condition, there are crater-shaped depressions on the teeth of the lower jaw up to the level of the enamel-dentine border, the height of the lower part of the face is reduced by 6 mm compared to the state of physiological rest. Make a diagnosis taking into account the Kennedy classification. Make a treatment plan.

3. Patient A., 62 years old, missing teeth 1.8, 2.5, 2.6, 2.7, 2.8, 3.5, 3.6, 3.7, 3.8, 4.6, 4.7, 4.8, dentoalveolar elongation of teeth 1.7, 1.6, 1.5 is determined, wear facets are determined on teeth 4.1, 4.2, 4.3, 3.1, 3.2, 3.3 (IDOST)> 40%), Make a diagnosis. Make a treatment plan. How is the load that occurs during chewing distributed and what complications can arise? from the temporomandibular joint?

4. Patient N., 65 years old, came with complaints of increased tooth wear, tooth sensitivity to temperature stimuli, as well as an aesthetic defect. History of: stressful lifestyle, signs of bruxism. Objectively: abrasion facets are determined, especially in the area of canines and molars. Teeth 1.3, 1.2, 1.1, 2.1, 2.2, 2.3 are restored with photopolymer restorations. What signs characterize increased tooth abrasion? What etiological factors cause it? What are the stages of development and classification by the degree of abrasion?

5. Patient F., 53 years old. Complaints: unsatisfactory aesthetics and impaired chewing of food. History of the disease: prosthetics were performed 10 years ago. According to the patient, the missing teeth were removed as a result of caries and its complications. Objective examination data, external examination: a decrease in the height of the lower part of the face by 3 mm, pronounced nasolabial folds, drooping corners of the mouth, facial asymmetry is observed. On the upper jaw: missing teeth 1.5, 1.4, 2.4, 2.6, 2.7. Metal-ceramic prosthesis supported by teeth 1.6, 1.3, unsatisfactory marginal fit of the crowns, partial de-cementation. Deep caries of teeth 1.1, 2.1, 1.2, 2.2. Fracture of the metal-ceramic bridge prosthesis 2.3, 2.5, 2.8. On the lower jaw: missing teeth 3.8, 3.6, 4.6. Metal-ceramic bridge prosthesis supported by teeth 3.7, 3.5, 3.4, unsatisfactory fixation of the prosthesis, partial de-cementation of the artificial crowns on all supporting teeth, recession and hyperemia of the marginal gingiva. Increased abrasion of teeth 3.3, 3.2, 3.1, 4.1, 4.2, 4.3. Secondary deep caries of tooth 4.4. The crown of tooth 4.5 is completely destroyed. Fracture of the metal-ceramic prosthesis supported by teeth 4.5, 4.7, the crown of tooth 4.5 and the facet of tooth 4.6 are missing. Complete de-cementation of the artificial crown on tooth 4.7. Mismatch of the cosmetic center. Make a diagnosis. Make a comprehensive treatment plan excluding implantation. List the clinical stages of manufacturing metal-ceramic dentures. Name the method for determining the height of the lower face in central occlusion, what is the essence of the method.

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

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4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 16 p.

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5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 14

Subject: Methods of orthopedic treatment of patients with increased tooth abrasion.
Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ка	58
6.	Final stage	13

Purpose of the lesson: to teach students methods of treating increased tooth wear. Examination of patients and diagnosis of "increased tooth wear" according to the clinical protocol of the Ministry of Health of the Republic of Belarus.

Objectives of the lesson:

1. To consolidate knowledge about the etiology and pathogenesis of increased tooth wear
2. To teach students the general principles of treating increased tooth wear
3. To become familiar with the basic principles of treating generalized increased tooth wear.
4. To become familiar with the basic principles of treating localized increased tooth wear.
5. To become familiar with the features of medical dispensary observation of patients with increased tooth wear.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: control survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3.

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from anatomy: anatomical structure of teeth, dental arches and jaws, TMJ;
- from general dentistry: types of orthopedic structures that restore the crown part of the tooth;
- from orthopedic dentistry: clinical and laboratory stages of manufacturing non-removable orthopedic structures.

Control questions from related disciplines:

1. Anatomical structure of the upper and lower jaw.
2. Anatomy of the TMJ.

3. Clinical and laboratory stages of manufacturing pin structures.
4. Clinical and laboratory stages of manufacturing temporary crowns.

Control questions:

1. Clinical manifestations of increased tooth wear.
2. Objectives of orthopedic treatment of patients with increased tooth wear.
3. Types of orthopedic structures for restoration of lost dental tissue.
4. Medical dispensary observation of patients with increased tooth wear.

ITW TREATMENT

The general principles of medical prevention and treatment of ITW:

- improving the patient's quality of life;
- improving the functions of the masticatory-speech apparatus; eliminating the overload of periodontal tissues;
- preventing the development of pathological processes and complications; improving the aesthetics of the face and teeth.

Planning of complex treatment of patients with ITW includes the following stages:

- preparatory activities;
- medical observation;
- therapeutic treatment (motivation to form healthy daily habits related to dental health, recommendations on the choice of methods, items and means of personal oral hygiene, nutritional recommendations, professional removal of dental plaque, the use of drugs for the treatment of dentin sensitivity and remineralizing therapy of hard dental tissues, restoration of teeth with filling material);
- orthodontic treatment (in case of dentoalveolar anomalies), orthopedic treatment (in case of defects of teeth and dentition, severe form of pathological process);
- hardware treatment (splint therapy aimed at achieving muscle relaxation, reposition, stabilization, functional protection);
- surgical treatment (in case of loss of the level of epithelial attachment); supportive treatment (dispensary care).

Therapeutic treatment measures are carried out by a dentist-therapist in patients with ITW and include:

mandatory treatment measures:

- hygienic measures (motivation and training in oral hygiene, professional removal of dental plaque to the OHI-S hygiene index $< 0.3-0.6$);
- elimination of local unfavorable factors contributing to the development of ITW;
- use of drugs for the treatment of dentin sensitivity and remineralizing therapy of hard dental tissues;

additional treatment measures (for medical reasons):

- restoration of teeth with defects in hard tissues using composite or other materials, including the use of pin structures; endodontic treatment for medical reasons.

Orthopedic treatment of ITW (carried out by an orthopedic dentist) includes:

- pain relief for medical reasons using the main drugs used in the treatment of patients (adult population) with ITW;
- production of pin structures (for medical reasons); preparation for artificial crowns, inlays, veneers;
- production of temporary crowns (except for prepared teeth for stamped crowns);
- obtaining analog or optical (3D) impressions;

- determination and recording of the central jaw ratio or central occlusion using wax or plastic bases with occlusal ridges or occlusal silicone materials;
- selection of color, size and shape of artificial crowns, inlays, veneers, in accordance with the existing teeth and individual characteristics of the patient;
- application and fitting of the artificial crown framework;
- application and fitting of the finished artificial crown, inlay, veneer;
- fixation of an artificial crown on a temporary material (for medical reasons);
- fixation of an artificial crown, inlay, veneer on a permanent material; recommendations for hygienic care of dental prostheses, rules of adaptation and timing of replacement of structures.

In case of IDOST (index of destruction of the occlusal surface of the tooth) from 0.4 to 0.6, the production of inlays and veneers is indicated; with an IDOST from 0.6 to 0.8, the production of artificial crowns is indicated; with an IDOST greater than 0.8, the use of pin structures with subsequent production of artificial crowns is indicated.

TREATMENT PRINCIPLE OF PATIENTS WITH INCREASED TOOTH WEAR of I DEGREE

1. Prosthetics of the lateral group of teeth with counter structures:
 - inlays - metal, ceramic;
 - crowns - metal (solid cast or stamped with cast occlusal pads), all-ceramic, metal-ceramic or metal-plastic.
2. Restoration of the front group of teeth:
 - direct composite restorations;
 - ceramic veneers;
 - crowns - metal-ceramic, combined stamped with cast pads (according to N.D. Borodyuk, L.S. Velichko), all-ceramic.
3. Carrying out remineralizing therapy.
4. Therapy for hypersensitivity of hard dental tissues.

TREATMENT PRINCIPLE OF PATIENTS WITH INCREASED TOOTH WEAR of II DEGREE

1. Prosthetics of the lateral group of teeth with artificial crowns:
 - cast metal;
 - stamped with cast occlusal pads;
 - all-ceramic;
 - metal-ceramic.
2. Prosthetics of the front group of teeth:
 - ceramic veneers;
 - crowns - metal-ceramic, combined stamped with cast pads (according to N.D. Borodyuk, L.S. Velichko), all-ceramic.
3. Prosthetics in the presence of defects in the dentition:
 - bridge dentures - cast, metal-ceramic, metal-ceramic and metal-plastic with cast occlusal protectors;
 - clasp dentures with cast occlusal pads;
 - combined removable-non-removable structures (fixed dentures + clasp or clasp dentures);
 - prosthetics supported by dental implants;
 - with a small number of remaining teeth - covering dentures (with telescopic fixation, with clasp fixation (root or intra-root), with magnetic fixation).

TREATMENT PRINCIPLE OF PATIENTS WITH INCREASED TOOTH WEAR of III DEGREE

As a rule, mandatory endodontic preparation and restoration of the stump parts of the supporting teeth with pin structures is required.

1. Dental prosthetics with artificial crowns:

- cast metal;*
- stamped with cast occlusal pads;*
- all-ceramic;*
- metal-ceramic.*

2. Prosthetics in the presence of defects in the dentition:

- bridge prostheses - cast, metal-ceramic, metal-ceramic and metal-plastic with cast occlusal protectors;*
- clasp dentures with cast occlusal pads;*
- combined removable-non-removable structures (fixed dentures + clasp dentures with lock or clasp fixation);*
- prosthetics supported by dental implants;*
- if there is a small number of remaining teeth – covering dentures (with telescopic fixation, with lock fixation (root or intra-root), with magnetic fixation).*

SITUATIONAL TASKS

1. Patient F., 51 years old. Complaints: difficulty chewing food, aesthetics of the lower anterior teeth. Medical history: notes the absence of lateral teeth on the lower jaw for about 3.5 years. At the same time, metal-ceramic crowns were made for the upper jaw and, a month after the extraction, a removable plate denture with curved clasps for the lower jaw. The removable denture broke while chewing about two years ago. The patient did not seek repair or manufacture of a new denture. Over the past two years, the patient has noted a decrease in the size of the lower anterior teeth. Examination of the oral cavity: a metal-ceramic bridge denture is fixed on the upper jaw with abutments: 1.7, 1.4, 1.3, 1.2, 1.1, 2.1, 2.2, 2.3, 2.4, 2.7. Teeth 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4 have abrasion facets within the enamel and dentin. Small amounts of hard dental deposits are observed on the teeth of the lower jaw. Teeth 3.4, 4.4 have composite restorations. Make a diagnosis, make a treatment plan.

2. Patient S., 56 years old, complained of difficulty chewing food, aesthetic defect, and periodic pain in the temporomandibular joint. History: missing teeth of the upper and lower jaws were removed due to periodontal disease and complicated caries 12 years ago, pain in the joints began to bother more intensely in the last six months. Objectively: fillings in teeth 1.3, 2.3, 3.6 are in satisfactory condition, there are crater-shaped depressions down to the enamel-dentin junction on the lower jaw teeth, the height of the lower part of the face is 6 mm lower than in the state of physiological rest. Make a diagnosis taking into account the Kennedy classification. Make a treatment plan.

3. Patient A., 62 years old, missing teeth 1.5, 1.6, 1.7, 1.8, 2.5, 2.6, 2.7, 2.8, 3.5, 3.6, 3.7, 3.8, 4.6, 4.7, 4.8. Make a diagnosis. Make a treatment plan. How is the load that occurs during chewing distributed and what complications can arise? From the temporomandibular joint?

4. Patient R., 45 years old, has been diagnosed with bruxism. What additional examination method will you use to determine the tone of his chewing muscles? Describe the methodology for using this method.

5. Patient B., 65 years old, complains of difficulty chewing food, periodic pain in the area of tooth 2.2, unsatisfactory aesthetics. History of the disease: teeth were removed throughout her life due to caries and its complications. The first prosthetics were done 20 years ago, the last visit to the dentist was about 3 years ago. Objective examination data, external examination: decrease in the height of the lower part of the face by 2 mm. Examination of the oral cavity: orthognathic

bite. There is a diastema between teeth 1.1 and 2.1. In the oral cavity, anomaly in the position of teeth 3.1, 4.1. Dentoalveolar deformation of teeth: 1.7, 2.7, 3.7, 3.8 horizontally. Wedge-shaped defects of teeth 1.3, 1.4. Pathological generalized abrasion of teeth on the upper jaw to dentin and lower jaw in the frontal section. Make a diagnosis, make a treatment plan.

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

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2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.
3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed.– Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 15

Subject: Orthopedic treatment for patients with increased abrasion complicated by TMJ dysfunction.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ka	58
6.	Final stage	13

Purpose of the lesson: to teach students methods of treating increased tooth wear complicated by TMJ dysfunction. Examination of patients and diagnosis of "increased tooth wear" according to the clinical protocol of the Ministry of Health of the Republic of Belarus.

Objectives of the lesson:

1. To study the etiology of increased tooth wear complicated by TMJ dysfunction.
2. To study the methods of examining patients with increased tooth wear complicated by TMJ dysfunction.
3. To study the clinical manifestations of increased tooth wear complicated by TMJ dysfunction.
4. To become familiar with the basic principles of treating increased tooth wear complicated by TMJ dysfunction.
5. To become familiar with the features of medical dispensary observation of patients with increased tooth wear complicated by TMJ dysfunction.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3.

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from anatomy: anatomical structure of the TMJ;
- from orthopedic dentistry: methods for determining the interalveolar height of the bite.
- from surgical dentistry: methods for diagnosing TMJ pathologies

Control questions from related disciplines:

1. Anatomical structure of the TMJ.

2. Anatomical structure of the upper and lower jaw.
3. Muscles that lift the lower jaw.
4. Muscles that lower the lower jaw.
5. Structure of the periodontium.

Control questions:

1. Etiology of increased tooth wear with development of temporomandibular joint (TMJ) dysfunction.
2. Diagnosis of TMJ condition in patients with increased tooth wear.
3. Orthopedic structures used to restore teeth in patients with increased tooth wear complicated by TMJ dysfunction.
4. Integrated approach to treating patients with increased tooth wear complicated by TMJ dysfunction.
5. Preventive measures after integrated treatment of patients with increased tooth wear complicated by TMJ dysfunction.

EXAMINATION OF A PATIENT WITH TMJ DYSFUNCTION

Severe forms of pathological tooth wear with defects of the dental arches, traumatic occlusion, parafunction of the masticatory muscles and dysfunction of the TMJ are characterized by a complex clinical picture and often confusing symptoms. Diagnosis, planning and implementation of orthodontic preparation, construction of the occlusal surface of the dental arches in these cases cause great difficulties.

An objective examination of such patients should begin with an external examination. In this case, as a rule, **two important signs are revealed: shortening of the lower third of the face and displacement of the lower jaw.**

The latter often causes facial asymmetry. Displacement of the lower jaw to the side and facial asymmetry often accompany bruxism and sliding bite. In case of lateral displacement and sliding bite, the amount of displacement is determined by the discrepancy of the midline. It is also necessary to identify possible occlusal causes of such displacement (uneven abrasion, premature contacts on the teeth or artificial crowns, etc.). After examination, you can begin palpating various parts of the face to identify areas of pain. In patients with parafunction of the masticatory muscles, palpation usually reveals a dull pain in the zygomatic arch, in the angle of the lower jaw and muscle attachment sites. The joint should be palpated with closed dental arches and in all kinds of movements. Palpation during opening and closing the mouth allows you to determine the amplitude of movement in the joint, as well as clicking and crunching. The posterior surface of the articular head can be palpated through the external auditory canal. After external examination and palpation, it is necessary to begin examining the teeth and dental arches. Study of plaster models, determination of electrical excitability of the pulp and X-ray examination of the teeth. In patients with TMJ dysfunction, in addition to these methods, additional diagnostic methods are used: electromyography, myotonometry of the masticatory muscles, as well as X-ray examination and mechanoarthrography of the TMJ. There are several methods of X-ray examination of the joint: overview radiography (images according to Schuller and Parma), linear tomography, arthrography, X-ray cinematography, etc. The mechanoarthrography method allows recording the rotational-sliding movement of the articular heads when moving the lower jaw. X-ray computed tomography of the TMJ is one of the valuable and necessary methods that complement and clarify the examination. It allows you to accurately determine the topographic relationship of the joint elements before, during and after orthopedic treatment.

TREATMENT OF ITW COMPLICATED BY TMJ DYSFUNCTION

The general principles of medical prevention and treatment of ITW are:

- improving the patient's quality of life;

- improving the functions of the masticatory and speech apparatus; eliminating periodontal tissue overload;
- preventing the development of pathological processes and complications; improving the aesthetics of the face and teeth.

Planning complex treatment for patients with ITW includes the following stages:

- preparatory measures;
- medical observation;
- therapeutic treatment (motivation to form healthy daily habits related to dental health, recommendations for choosing methods, items and means of personal oral hygiene, nutritional recommendations, professional removal of dental plaque, the use of drugs to treat dentin sensitivity and remineralizing therapy for hard dental tissues, restoration of teeth with filling material);
- orthodontic treatment (for dentoalveolar anomalies), orthopedic treatment (for defects of teeth and dental arches, severe form of the pathological process);
- apparatus treatment (splint therapy aimed at achieving muscle relaxation, reposition, stabilization, functional protection); - surgical treatment (in case of loss of the epithelial attachment level); supportive treatment (dispensary care).

Therapeutic treatment measures are carried out by a dentist-therapist in patients with ITW and include:

mandatory treatment measures:

- hygienic measures (motivation and training in oral hygiene, professional removal of dental plaque to the OHI-S hygiene index $< 0.3-0.6$);
- elimination of local unfavorable factors contributing to the development of ITW;
- use of drugs for the treatment of dentin sensitivity and remineralizing therapy of hard dental tissues;

additional treatment measures (for medical reasons):

- restoration of teeth with defects in hard tissues using composite or other materials, including the use of pin structures; endodontic treatment for medical reasons.

Orthopedic treatment of ITW (carried out by an orthopedic dentist) includes:

- pain relief for medical reasons using the main drugs used in the treatment of patients (adult population) with ITW;
- production of pin structures (for medical reasons); preparation for artificial crowns, inlays, veneers;
- production of temporary crowns (except for prepared teeth for stamped crowns);
- obtaining analog or optical (3D) impressions;
- determination and recording of the central jaw ratio or central occlusion using wax or plastic bases with occlusal ridges or occlusal silicone materials;
- selection of color, size and shape of artificial crowns, inlays, veneers, in accordance with the existing teeth and individual characteristics of the patient;
- application and fitting of the artificial crown framework;
- application and fitting of the finished artificial crown, inlay, veneer;
- fixation of an artificial crown on a temporary material (for medical reasons);
- fixation of an artificial crown, inlay, veneer on a permanent material; recommendations for hygienic care of dental prostheses, rules of adaptation and timing of replacement of structures.

Additional orthopedic measures in the treatment of ITW (for medical reasons) are:

use of an occlusal splint to eliminate excessive occlusal contacts of teeth and dentures, as well as in TMJ diseases, functional disorders of the masticatory muscles;

Orthopedic treatment of ITW complicated by TMJ dysfunction **should be comprehensive and aimed primarily at eliminating pain.**

Before and during orthopedic treatment, the following are useful:

- physiotherapy;
- drug therapy;
- therapeutic exercise.

Orthopedic treatment includes:

- elimination of the cause of the disease (if it is not excluded);
- selective grinding (according to indications);
- hardware treatment to normalize the interalveolar height, the position of the lower jaw and restructuring the function of the masticatory muscles;
- rational dental prosthetics.

One of the most effective measures for treating TMJ dysfunction caused by pathological tooth wear is the restoration of the interocclusal height, after which the function of the masticatory muscles gradually normalizes.

In most patients with this pathology, pain decreases within a week after the bite height is restored, and subsequently, the symptoms of joint dysfunction completely disappear. The bite height and position of the lower jaw are restored using a plastic cap (or dental or gingival, as indicated) in stages, increasing the interocclusal height at a time by no more than 4 mm. The duration of treatment with a cap in the absence of a lateral shift of the lower jaw is 3-6 months. When a reduced bite is combined with a lateral shift of the lower jaw, it is necessary to normalize the position of the jaw in the transverse direction. If there is a lateral displacement of the jaw of up to 4 mm, the jaw can be put in the correct position using the same plastic cap on which the bite height is restored. When closing the mouth, it will no longer be convenient for the patient to put the jaw in its previous habitual position, since this is prevented by the clear imprints of the antagonist teeth on the cap. Thus, the patient is forced to put the jaw in the correct position. With a more significant displacement of the lower jaw, this method is not effective enough. With a displacement of more than 4 mm, a splint with an inclined plane is used. The inclined plane contacts the buccal surface of the antagonizing molars and premolars, covering 2/3 of the length of the crowns of these teeth. The duration of treatment with a splint in the presence of a lateral shift of the lower jaw is 6-8 months. With subsequent prosthetics, the interocclusal height and normal position of the lower jaw are fixed.

In case of IDOST (index of destruction of the occlusal surface of the tooth) from 0.4 to 0.6, the production of inlays and veneers is indicated; with an IDOST from 0.6 to 0.8, the production of artificial crowns is indicated; with an IDOST greater than 0.8, the use of pin structures with subsequent production of artificial crowns is indicated.

Medical monitoring of the treatment results is recommended to be carried out by conducting medical examinations of patients by an orthopedic dentist 6 months after completion of the comprehensive treatment. Subsequent medical monitoring of the condition of teeth and dentures is recommended to be performed 2 times a year (every 6 months). Each medical examination involves a repeated assessment of the condition of hard tissues of teeth, dental arches, fillings, dentures, the condition of periodontal tissues and the oral mucosa, and a hygienic assessment of the oral cavity. Also, each time a patient with dentures visits, it is recommended to undergo professional oral hygiene with a general dentist.

SITUATIONAL TASKS

1. Patient B., 48 years old, complains of pain in the left half of the face, fatigue when chewing hard food. Signs of bruxism are observed in the anamnesis. These complaints appeared about a year ago, she sought help two weeks ago. A clinical examination and CBCT (Cone Beam Computed Tomography) of the TMJ were performed. The results of the studies are within the normal range. Palpation of the TMJ is painless. Movements of the lower jaw are within the

physiological norm. There is pathological abrasion of teeth 1.3, 1.2, 1.1, 2.1, 2.2, 2.2. Make a diagnosis. What studies should be done to clarify the diagnosis.

2. Patient V., 47 years old, came with complaints of difficulty chewing and complete absence of teeth on the lower jaw. There is a complete removable denture on the lower jaw, used for 7 years. Complaints of rapid fatigue of the masticatory muscles and clicking in the TMJ when chewing. Objectively: the corners of the mouth are lowered, the chin protrudes, there is abrasion of the teeth on the denture and directly in the oral cavity. Make a diagnosis and plan treatment.

3. Patient O., 45 years old, came to the clinic with complaints of clicking in the joint, limited mouth opening and pain in the TMJ area. Objectively: the corners of the mouth are lowered, teeth 1.8, 1.7, 1.6, 1.5, 2.8, 2.7, 2.6, 2.5, 3.8, 3.7, 3.6, 3.5, 4.8, 4.7, 4.6, 4.5 are missing in the oral cavity. Signs of increased abrasion of all teeth are determined. The radiograph shows a narrowing of the joint space. Make a diagnosis. What causes TMJ compression? What complications lead to this pathology? What changes occur with the articular disc in this pathology? Make a treatment plan.

4. Patient P., 56 years old, consulted an orthopedist for examination and further prosthetics. Objectively: the face is symmetrical, there are no chewing teeth in the oral cavity on the upper jaw, teeth 3.8, 3.7, 3.6, 3.5, 3.4 are missing on the lower jaw. There is limited opening of the mouth in the morning and clicking in the joint during the day. Patient examination plan? In what diseases is there a limitation in opening the mouth? Make a treatment plan.

5. Patient O., 45 years old, consulted with complaints of pain in the TMJ area when opening her mouth, muscle asymmetry when clenching the jaws in the central occlusion position. Objectively: the facial configuration has minor changes, as a result of palpation of the TMJ, pain in the anterior wall of the external auditory canal was revealed. Teeth 1.8, 1.2, 1.7, 1.6, 1.5, 1.4 are missing. Make a diagnosis. Name the main and additional methods of TMJ disease diagnostics. Make a treatment plan.

LITERATURE

Basic:

1. Implant Prosthodontics. A patient-oriented concept: Planning | Treatment procedures | Evaluation | Esthetics | Function | Digital technologies | Dental Technology / Author: Stefan Wolfart. – 2nd completely revised and significantly expanded Edition. – Quintessence Publishing, 2026. – 1120 p.

Additional:

2. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 32 p.
3. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 30 p.
4. Removable partial dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^d ed. – Minsk : BSMU, 2018. – 16 p.

Electronic courseware for the educational discipline «Maxillofacial prosthetics and prosthodontics»

5. <https://etest.bsmu.by/course/view.php?id=498>.

LESSON 16

Subject: Diagnostics and treatment of patients with TMJ diseases. Etiology, pathogenesis, clinical manifestations, differential diagnostics, orthopedic treatment methods.

Total class time: - 7 academic hours (280 minutes).

Class planning

№	Stages of a practical class	Time in min.
1.	Organizational stage	15
2.	Control of the initial knowledge level	30
3.	Training stage	58
4.	Practicing a practical skill	106
5.	Monitoring the level of the obtained knowledge or mastery of a practical skill ка	58
6.	Final stage	13

Purpose of the lesson: to teach students the general principles of diagnosis, treatment and medical prevention of temporomandibular joint diseases, to master the planning of complex treatment of patients with temporomandibular joint diseases according to the clinical protocol of the Ministry of Health of the Republic of Belarus.

Objectives of the lesson:

1. To study the etiology of temporomandibular joint diseases.
2. To study the pathogenesis of temporomandibular joint diseases.
3. To study the clinical manifestation of temporomandibular joint diseases.
4. To study the methods of examination of patients with temporomandibular joint diseases.
5. To study the methods of orthopedic treatment of patients with temporomandibular joint diseases.

Class location - the clinical setting.

Practical skills mastered during the class:

Diagnosing and treatment planning for patients.

Form of control of the practical class: survey, electronic testing, solving situational problems.

Place of practical skill implementation – at the outpatient appointment.

Practical skill assessment criteria – according to the assessment sheet (checklist) for monitoring practical skills in the academic discipline in points from 0 to 3.

Requirements for the initial level of knowledge

To master the topic comprehensively, a student has to review:

- from anatomy: anatomical structure of teeth, dental arches and jaws, anatomical structure of the TMJ;
- from general dentistry: new technologies and modern construction materials in restoration of the crown part of the tooth;
- from orthopedic dentistry: defects of the crown part of the tooth, index of destruction of the occlusal surface of the tooth, increased abrasion of the teeth.

Control questions from related disciplines:

1. Anatomical structure of the upper jaw.
2. Anatomical structure of the lower jaw.
3. Muscles that raise the lower jaw.
4. Muscles that lower the lower jaw.
5. Structure of the periodontium.
6. Anatomy of the TMJ.

Control questions:

1. Diagnosis of "Temporomandibular joint diseases".
2. Etiology of temporomandibular joint diseases.
3. Methods of examination of patients with temporomandibular joint diseases.
4. Classification of temporomandibular joint diseases.
5. Integrated approach to treating patients with temporomandibular joint diseases.
6. Preventive measures after integrated treatment of patients with temporomandibular joint diseases.

The code according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision is K07.6 Diseases of the temporomandibular joint (hereinafter referred to as TMJ): TMJ pain dysfunction syndrome, Costen's syndrome, "clicking" jaw.

TMJ diseases are a symptom complex characterized by pain in the TMJ and masticatory muscles, radiating to the head and neck, noise and pain when moving the lower jaw, disorders of the ligament-capsular apparatus, as well as disorders of the bone and cartilage tissue of the articular surfaces.

TMJ pain dysfunction syndrome is a disease characterized by constant or intermittent pain in the TMJ and masticatory muscles, radiating to the head and neck.

Costen's syndrome is a symptom complex characterized by myofascial facial pain, dizziness, ear congestion, dysfunction of the TMJ and masticatory muscles, combined with occlusal disorders, most often a decrease in the interalveolar height in habitual occlusion.

"Clicking" jaw is a pathology most often caused by a lack of coordination between the movement of the articular disc and the head of the TMJ, characterized by noise phenomena (clicks, crackling, clapping) when opening and closing the mouth, and a violation of the excursion of the lower jaw in different phases of its movement.

TMJ diseases are divided by etiopathogenetic factor:

- psychogenic
- arthrogenic
- myogenic
- occlusal
- infectious
- symptomatic
- neurogenic

Signs and criteria of TMJ diseases**Signs and criteria of TMJ pain dysfunction syndrome:**

- constant or intermittent pain, accompanied by limited mobility of the lower jaw (or, conversely, excessive range of motion);

- sound phenomena during movements of the lower jaw (painless or painful, often being a marker of a trigger or irradiation: with myogenic and psychogenic etiology, the trigger is localized in the muscular apparatus, with arthrogenic - in the TMJ, with symptomatic - in the area of the affected organ, with occlusal - in the area of the dentition and jaws, with neurogenic - in the area of the innervation zone of the corresponding nerve trunk);

- absence of pronounced radiographic changes in the early stages of the disease (signs of bone tissue destruction, osteophytosis, disruption of the end cortical plate in the area of TMJ elements);

- asymmetry of the movement of the lower jaw; deviations when opening (closing) the mouth; facial asymmetry;

Signs and criteria of Costen's syndrome:

- myofascial facial pain; dizziness; ear congestion;

- limited mobility of the lower jaw or excessive range of motion, occlusal disorders (increased tooth wear or tooth loss, deformation of the dentition) with a decrease in the interalveolar height in the usual occlusion;

Signs and criteria of "clicking" jaw:

- sound phenomena when moving the jaw;

- absence of pronounced radiographic changes in the early stages of the disease (signs of bone destruction, osteophytosis, disruption of the end cortical plate in the area of TMJ elements);

- asymmetry of the lower jaw movement; deviations when opening (closing) the mouth.

MAIN DIAGNOSTICS METHODS OF TMJ DISEASES

- anamnesis collection;

- external examination and palpation of the maxillofacial area with determination of symmetry and pain triggers;

- palpation of the maxillofacial muscles;

- examination of the oral cavity using additional instruments; percussion;

- assessment of the condition of teeth, dental arches, dentures, changes in the prosthetic plane and occlusal curves;

- assessment of the bite;

- assessment of the interalveolar distance, analysis of the crest of the alveolar part of the jaw bone (shape, relief, thickness, presence of defects, growths);

- assessment of the condition of periodontal tissues and oral mucosa; index assessment of dental health: hygiene index (hygiene index Green, Vermillion - OHI-S);

- instrumental examination (radiological examination method): orthopantomography of the jaws and TMJ.

SUPPLEMENTARY DIAGNOSTICS METHODS OF TMJ DISEASES

- instrumental examinations (radiological examination methods): cone-beam computed tomography of the maxillofacial region, cone-beam computed tomography of the TMJ, magnetic resonance imaging of the TMJ;

- use of devices (face bow, HIP analyzer, others) for spatial orientation of the upper jaw model in the articulator and for transmitting the hinge axis of rotation of the lower jaw with subsequent functional analysis of the dentoalveolar system;

- detection and analysis of excessive occlusal contacts of teeth and artificial dentures (supercontacts);

- examinations in the area of the TMJ: palpation; auscultation with analysis of sound phenomena during movements of the lower jaw;

- functional diagnostic studies (functional tests, electromyography);

- consultation with a medical specialist for medical reasons (dentist-orthodontist, otolaryngologist, endocrinologist, hematologist, cardiologist, gastroenterologist, rheumatologist, neurologist, infectious disease specialist, psychotherapist, psychiatrist-narcologist, allergist-immunologist, radiologist, clinical laboratory diagnostician, physiotherapist, general practitioner and others);

- assessment of the relationship between TMJ diseases and the general somatic status, as well as clarification of the need for consultation with medical specialists;
- photography to assess the aesthetics of the smile and face, as well as analysis of the dentoalveolar system;
- determination of the connection with parafunctional habits;
- ultrasound methods of TMJ examination (for medical reasons).

When diagnosing TMJ diseases, the general somatic condition of patients is also determined first of all, with the identification of pathology that can affect the choice of treatment method (bronchial asthma, epilepsy, endocrine system condition, allergic reactions, etc.), and the following is purposefully identified:

- **inadequate psychoemotional state of the patient;**
- **acute lesions of the oral mucosa and red border of the lips; acute inflammatory diseases of the organs and tissues of the mouth;**
- **periodontal diseases in the acute stage; unsatisfactory hygienic condition of the oral cavity; desire to be treated or refusal of treatment**

ORTHOPEDIC TREATMENT OF TMJ DISEASES

The general principles of medical prevention and treatment of TMJ diseases are:

- elimination of pain syndrome; improvement of the patient's quality of life;
- improvement of the functions of the masticatory-speech apparatus;
- elimination of periodontal tissue overload.

Planning of complex treatment of patients with TMJ diseases includes the following stages:

- preparatory activities; medical observation;
- therapeutic treatment (motivation to form healthy daily habits related to dental health, recommendations on the choice of methods, items and means of personal oral hygiene, nutritional recommendations, professional removal of dental plaque, treatment of caries and its complications, non-carious lesions, periodontal diseases);
- orthodontic treatment (in case of dentoalveolar anomalies);
- orthopedic treatment (in case of defects of teeth and dentition, increased abrasion, tooth mobility);
- hardware treatment (splint therapy aimed at achieving muscle relaxation, reposition, stabilization, functional protection);
- surgical treatment (in case of loss of the epithelial attachment level); supportive treatment (dispensary examination).

Orthopedic treatment of TMJ diseases includes:

mandatory treatment measures:

- use of drugs used in the treatment of patients with TMJ diseases according to the clinical protocol "Diagnostics and treatment of patients (adult population) with temporomandibular joint diseases";
- use of hardware treatment methods (occlusal splint) for medical reasons;

additional treatment measures (for medical reasons):

- use of orthopedic, orthodontic, surgical and therapeutic treatment methods aimed at restoring the functional and aesthetic characteristics of the dental system and masticatory-speech apparatus;
- use of physiotherapeutic treatment methods (pulse electrotherapy, ultrasound therapy, laser therapy (magnetic laser therapy), magnetic therapy, infrared irradiation, heat therapy).

SITUATIONAL TASKS

1. Patient S., 21 years old. Student. Complains of acute, paroxysmal pain in the lower jaw on the right side radiating to the temple and TMJ area. Objectively: orthognathic bite. There is a deep carious cavity on the chewing surface of tooth 3.6. The pulp horn is exposed. Orthodontic

treatment for deep bite was performed at the age of 10-14. Determine the presumptive diagnosis. What additional research methods should be performed? Make a treatment plan.

2. Patient K., 61 years old, complained of pain in the TMJ when closing the mouth, sounds in the joint when chewing. First noticed the problems 2 years ago, before that he had not sought help anywhere. Objectively: the configuration of the face is unchanged, there is a complete removable plate denture on the upper jaw and a partial removable plate denture on the lower jaw. What anatomical structures does the TMJ have in its structure? What parts does the articular disc divide the joint cavity into? What movements occur in the TMJ? What diagnostic measures should be taken for the patient?

3. Patient A., 50 years old, came to the clinic with complaints of clicking in the joint, limited mouth opening and pain in the TMJ area. Objectively: the corners of the mouth are lowered, teeth 1.8, 1.7, 1.6, 1.5, 2.5, 2.6, 2.7, 2.8, 3.8, 3.7, 3.6, 3.5, 4.5, 4.6, 4.7, 4.8 are missing in the oral cavity. The radiograph shows a narrowing of the TMJ joint space on the left and right. Make a preliminary diagnosis? What are the causes of TMJ compression? What complications lead to this pathology? What changes occur with the articular disc in this pathology? Make a preliminary treatment plan.

4. Patient I., 39 years old, complained of limited mouth opening, noticed this pathology 4 days ago, before that similar symptoms did not appear. Objectively: the face is symmetrical, pathology was not detected during external examination. What is the normal maximum mouth opening? What is the physiological rest of the lower jaw? Make an examination and treatment plan?

5. Patient K., 45 years old, complained of pain in the TMJ area when opening her mouth, muscle asymmetry when clenching the jaws in the central occlusion position. Objectively: the facial configuration has minor changes, as a result of palpation of the TMJ, pain in the anterior wall of the external auditory canal was detected. Make an examination plan and a preliminary treatment plan.

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