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.
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METHODOLOGY TEXTS FOR PRACTICAL CLASSES

Maxillofacial orthopedics and orthopedic dentistry

(5 course 10 semester)

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

Discussed at the meeting of the
Department of Orthopedic Dentistry and
Orthodontics (Protocol No.6
dated 24.11.2025)

APPROVED by

Head of the department of orthopedic dentistry and orthodontics

 Ya.I.Timchuk

Protocol of the department meeting No. 6 dated 24.11.2025

Thematic plan of practical classes
on the subject "Maxillofacial orthopedics and orthopedic dentistry"
for the 5th year students of the 10th semester

1. Defects of the dental crown hard tissues. Inlays and veneers. *Diagnosing and treatment planning for patients*
2. Defects of the dental crown hard tissues. Artificial crowns. *Preparation of teeth for manufacturing metal-acrylic, metal-ceramic and metal-free bridge prostheses*
3. Defects of the dental crown hard tissues. Pin structures, cast post-and-core inlays. *Preparation of teeth for manufacturing restorative pin structures*
4. Partial defects of dental arches. Etiology, pathogenesis, classification, clinical manifestations, diagnostics of defects of dental arches. *Diagnosing and treatment planning for patients*
5. Etiology, pathogenesis, clinical manifestations, diagnostics of partial anodontia. *Filling in the training patient's medical record and job order during the orthopedic appointment*
6. Orthopedic treatment of patients with partial anodontia with fixed bridge prostheses. *Preparation of teeth for the production of metal-acrylic, metal-ceramic and metal-free bridge prostheses*
7. Orthopedic treatment of patients with partial anodontia with removable dentures. *Determination and fixation of the central relationship of the jaws in manufacturing removable dentures*
8. Orthopedic treatment of patients with partial anodontia with removable dentures. Clasp dentures. *Selection of the design and supporting elements of the clasp prosthesis depending on the size and topography of the defect*
9. Orthopedic treatment of patients with complete anodontia. *Diagnosing and treatment planning for patients*
10. Orthopedic treatment of patients with complete anodontia. Fitting of an individual tray (according to the Herbst method). Obtaining and evaluating functional impressions. *Determining the boundaries and fitting an individual tray to the upper and lower jaws using the Herbst tests. Obtaining a functional impression of the upper and lower jaws*
11. Orthopedic treatment of patients with complete anodontia. Methods of determining the central relationship of the jaws and constructing dental arches in the case of complete absence of teeth. *Correction, relining and recommendations for the use and care of complete removable dentures*

12. Etiology, pathogenesis, clinical manifestations, diagnostics and orthopedic treatment of patients with periodontal diseases. *Diagnosing and treatment planning for patients*

13. Biological bases of splinting. The role of occlusal trauma in the development of periodontal diseases. *Interpretation of odonto-periodontogram*

14. Temporary and permanent splinting. Orthodontic treatment for periodontal diseases. *Determining indications for temporary and permanent dental splinting. Selecting the design*

15. Dental implants. Types. Structural materials. Indications and contraindications for use . *Selection of dental implants depending on the clinical picture*

16. Orthopedic treatment of patients with partial anodontia with fixed dental prostheses supported by cement-retained dental implants. *Planning orthopedic treatment of patients with anodontia with fixed dental prosthesis structures supported by dental implants using cone-beam computed tomography*

17. Orthopedic treatment of patients with partial anodontia with fixed dental prostheses supported by dental implants with screw fixation. *Planning orthopedic treatment of patients with anodontia with fixed dental prosthesis structures supported by dental implants using cone-beam computed tomography*

18. Orthopedic treatment of patients with partial anodontia using dental implants supported by multi-units. *Planning orthopedic treatment of patients with anodontia with removable dental prosthesis structures supported by dental implants using cone-beam computed tomography*

19. Tactical, diagnostic and technological errors in orthopedic dentistry. *Providing emergency care during the dental appointment (fainting, shock, collapse).*

20. Organizational foundations of dental orthopedic care. *Hygienic hand rubbing.*

Lectures – 2 (3 hours)
Practical classes – 140
Weeks – 20
Total hours – 216 hours
Final certification – credit

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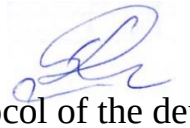
Head of the department of orthopedic dentistry and orthodontics

 Ya.I.Timchuk

Protocol of the department meeting No. 6 dated 24.11.2025

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. Errors and complications in orthopedic dentistry.
2. Organization of orthopedic dental care in the Republic of Belarus.

Lectures – 2 (3 hours)
Practical classes – 140
Weeks – 20
Total hours – 216 hours
Final certification – credit

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.
2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

BELARUS STATE MEDICAL UNIVERSITY

EXAMINATIONAL SHEET

of practical skills in the discipline « Maxillofacial orthopedics and orthopedic dentistry»

Course 5 Semester 10 Group ☐☐_____

Teacher Full names of the certification committee members Date

Planned acquisition of practical skills	Value in points	Progress notes ("yes", "no")		Examination group	Points
		Student	Teacher		
1. Filling in the patient's medical record during the orthopedic appointment	2				
2. Filling in the patient's job order during the orthopedic appointment	2				
3. Patient examination in the orthopedic dentistry clinic:					
3.1 Anamnesis, external examination of the patient, oral examination, examination of the dental arches	1				
3.2 Determination of tooth mobility degree	1				
3.3 Determination of periodontal atrophy degree	1				
3.4 Examination of edentulous alveolar process	1				
3.5 Analysis of radiographic examination data	1				
3.6 Interpretation of odontoparodontogram	1				
4. Diagnosing and treatment planning for patients	3				
5. Orthopedic treatment of patients with defects of the dental crown hard tissues:					
5.1 Preparation of teeth for manufacturing restorative inlays	2				
5.2 Preparation of teeth for manufacturing restorative pin structures	2				
5.3 Preparation of teeth for manufacturing metal-acrylic crowns	2				
5.4 Tooth preparation for a bridge-supported crown	2				
5.5 Modeling of a post and core restoration. Fitting and fixation	2				
5.6 Taking impressions with elastic materials	2				
5.7 Taking two-layer silicone impressions	2				
5.8 Fitting and fixing non-removable prostheses: inlays, post and core crowns, metal crowns, combined crowns, porcelain, plastic, MA, MK crowns	2				
5.9 Removing crowns	2				
5.10 Fabricating temporary crowns from fast-curing plastic	2				
5.11 Repair of veneers, coatings	2				
6. Orthopedic treatment of patients with partial edentulism:					
6.1 Determine the central occlusion with partial tooth loss (3 options)	3				
6.2 Selection of a bridge prosthesis design	3				
6.3 Ability to carry out all clinical stages of manufacturing bridge prostheses from various materials	3				
6.4 Determining and fixing the vertical relation of jaws when fabricating removable prostheses	3				
6.5 Choosing the design and supporting elements of a clasp prosthesis depending on the defect size and topography	3				
6.6 Check the framework of a clasp prosthesis	2				
6.7 Check the construction of plastic prostheses with partial tooth loss	2				
6.8 Repair and adjust removable prostheses	2				
6.9 Fitting and applying clasp and partial plastic removable prostheses	2				
7. Orthopedic treatment of patients with complete anodontia:					
7.1 Obtaining anatomical and functional impressions	3				
7.2 Determining the borders and fitting an individual tray for the upper and lower jaws using Herbst's probes	3				
7.3 Determining the central relation of jaws in complete tooth loss	3				
7.4 Checking the design of full removable plastic dentures, correcting errors in the determination of jaw relation	3				
7.5 Fitting and applying removable plastic dentures. Instructions to the patient on how to use the prostheses	3				

8. Orthopedic treatment of patients with periodontal diseases:					
8.1 Ability to examine a patient with periodontal diseases	3				
8.2 Ability to develop a treatment plan, odontoparodontogram, justify the prosthesis design	3				
8.3 Ability to perform selective tooth polishing	3				
8.4 Indications for temporary and permanent splinting of teeth. Choosing a design	3				
8.5 Ability to fit, place, and fix removable and fixed splints, prostheses, and their combinations for periodontal diseases	3				
9. Features of orthopedic treatment using dental implants:					
9.1 Selection of types of dental implants depending on the clinical situation	2				
9.2 Planning orthopedic treatment with fixed dental prostheses supported by implants using cone-beam CT	2				
9.3 Planning orthopedic treatment with removable prostheses supported by implants using cone-beam CT	2				
10. Emergency dental assistance:					
10.1 Providing emergency assistance during syncope	2				
10.2 Providing emergency assistance during anaphylactic shock	2				
10.3 Providing emergency assistance during collapse	2				

Total points **Mark**

Signatures:_____

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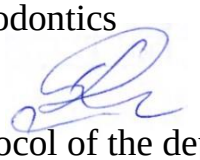
Head of the department of orthopedic dentistry and orthodontics

 Ya.I.Timchuk

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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, 10 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;

LESSON 1

Subject: Defects of the dental crown hard tissues. Inlays and veneers.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To expand and reinforce students' knowledge and skills regarding methods of patient examination, diagnosis formulation, clinical stages of prosthodontic restoration with inlays and veneers, and to improve their understanding of laboratory procedures involved in their fabrication.

Objectives of the lesson:

1. To teach students the general principles of patient examination when treating with veneers and inlays.
2. To instruct students on the general principles of planning prosthodontic treatment using veneers and inlays.
3. To familiarize students with the main types of veneers and inlays used in clinical practice for restoring hard tissue defects.
4. To inform students about indications and contraindications for the use of veneers and inlays.

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 fully master the topic, students should review:

- Topographical features of crown defects.
- Characteristics of carious and non-carious lesions of hard dental tissues.
- Safety zones of dental hard tissues per N.G. Abolmasov and B.S. Klyuev.
- Modeling materials used in direct inlay fabrication, and the requirements for these materials.
- Methods of taking impressions for indirect inlay fabrication, and the materials used.

Control questions from related disciplines:

1. Anatomy of the maxillofacial region.
2. Features of blood supply and innervation of the maxillofacial area.
3. Main anesthesia methods applied in prosthodontic dentistry during tooth preparation.

Control questions:

1. Etiology, clinical presentation, and examination methods for patients with hard tissue dental diseases.
2. Indications for correcting crown defects with inlays and veneers.
3. Basic principles of cavity preparation for inlays depending on defect topography and distribution of masticatory forces.
4. Methods and sequence of inlay fabrication.
5. Methods of veneer fabrication, stages, and tools for odontopréparation for veneers.
6. Criteria for assessing the quality of tooth preparation.
7. Fitting and fixation of veneers, materials used for fixation.
8. Errors and complications in prosthodontic restoration of crown defects with inlays and veneers.

SCHEME: "DAMAGE OF HARD DENTAL TISSUES"

Damage to the hard tissues of the teeth		Dental attrition
Defects of the tooth crown	Anomalies of tooth shape	Tooth discoloration
Caries	Microdontia	Dysplasia Capdepont
Fluorosis	Hutchinson's teeth	Tetracycline teeth
Hypoplasia	Fournier's teeth	Marble teeth
Hyperplasia	Pfluger's teeth	Hypoplasia
Wedge-shaped teeth	Peg-shaped teeth	Imperfect amelogenesis
Trauma	Macrodontia	Imperfect osteogenesis
Tooth erosion		
Necrosis of the hard tissues of the teeth		

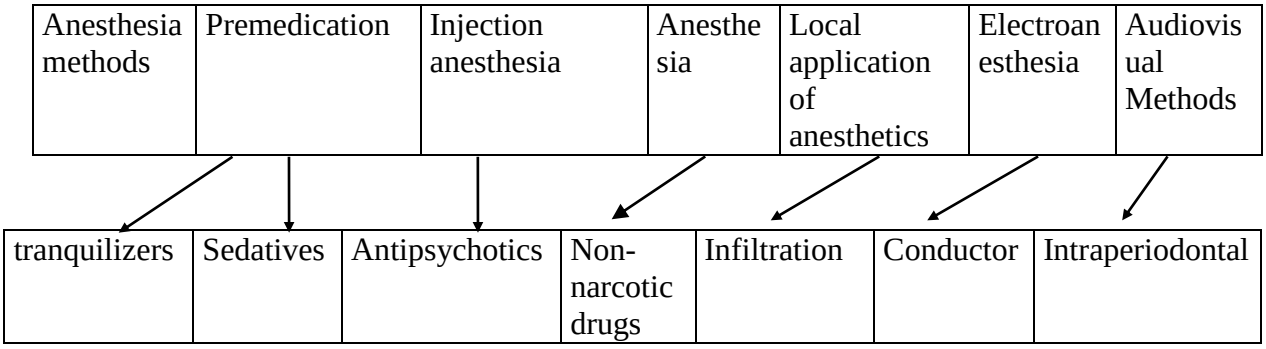
Scheme on the topic: "Methods of examining patients with defects in the crown part of the tooth"

Methods of examination	How it is conducted	Criteria for evaluating the conduct of research
1. Interview	Gathering of medical history	Has previous treatment been performed and its effectiveness
2. Examination	Visual inspection	1. Prevalence of damage to the crown part of the teeth and dental arches. 2. Identification of the cause that led to the formation of hard tissue pathology. 3. Position of the tooth in the dental arch and its inclination relative to the vertical plane. 4. Topography of the defect and its relation to occlusal loads.
3. Percussion	Probe handle, palpation, forceps	Evaluate the condition of the tooth's supporting apparatus (mobility, tenderness)
4. Instrumental	Probe	1. Degree of alveolar wall atrophy. 2. Thickness and presence of dentin in the walls limiting the defect. 3. Relationship of the defect to areas most affected by caries.
5. Electroodontodiagnosis	EOD-1 and EOM-3 devices	2-6 μA - normal, vital tooth; 7-12 μA - pulp hyperemia; 13-50 μA - pulpitis; 51-100 μA - periodontitis. Refer for pulpectomy if indicated.
6. Radiography	Radiographic examination room	Assess the relationship of the hard tissue defect with the topography of the tooth cavity and the condition of the pulp, determine the condition of the periodontal tissues

Scheme on the topic: "Indications for orthopedic treatment of patients with defects in the crown part of the teeth using fixed prostheses"

1. Defects in the crown part of the tooth	Partial		Complete
2. Topography of the defect according to Kurland's classification	Involvement of one surface	Combined involvement of two surfaces	Combined involvement of three surfaces
3. Size of the defect (percentage of occlusal surface area affected) according to Milikevich, (IROPZ)	0,4 – 0,6	0,6-0,8	More than 0,8
4. Types of fixed dental prostheses used to correct defects in the crown part of the teeth	Inlays	Restorative crowns	Restorative post and core constructions.

Scheme: “Methods of anesthesia during the preparation of teeth”



Facilities	Phenazepam0.001 g Trioxazine 0.3 Elenium 0.005	Valerian infusion, sodium bromide	Haloperidol 0.0015	Analgin 0.5 Sodium salicylate 0.25	Novocaine 2% Lidocaine 2% Ultracaine 1%,2% Septonest, scandonest 2%	Nitrous oxide, fluorothane	ELOZ-1 Electroson, Electroacupuncture	Hypnosis (suggestion), Audioanalgesia, Placebo

Patterns of recommended sequence of activities: "Clinical stages of tooth crown restoration when having class II defects according to Black's classification by using the inlay"

Stages of treatment	Toolkit	Criteria for self-control
1. Formation of a cavity		
a) processing of the contact surface of the tooth;	separation discs (diamond)	Visual access to the gingival papilla; Intact adjacent tooth;
b) formation of a cavity on the chewing surface of the tooth;	fissure dental drill, diamond;	Asymmetrical shape;
c) inside the tooth,	a fissure dental drill for an angled or turbine tip;	Parallel walls, flat bottom, rounded corners
2. Modeling of a wax inlay		
1*) direct method, i.e. direct modeling in the oral cavity;*	Wax "Lavax", spirit lamp, smoother, inlay extraction pin;	The wax composition should have clear imprints of the cavity contours, be easily removed and inserted into the cavity.
2) indirect method: *a) making the main double cast*	standard spoons, silicone impression material;	integrity of the impression, clear contours of the formed cavity, precise relief - imprint, absence of pores and pull-offs.
b) making an auxiliary cast from the antagonist teeth and casting the model.	Alginate or silicone impression material	clear relief of the chewing surfaces of the teeth
a) in the oral cavity	abrasive shaped heads for a straight handpiece	unhindered insertion and removal of the inlay from the tooth cavity in one direction only, uniform fit of the inlay to the tooth tissues, restoration of contact points;
b) by occlusion	the same	the inlay shouldn't disturb central and dynamic occlusions;
c) final processing, grinding and polishing	the same	creation of the anatomical shape of the crown surface, carefully polished inlay surfaces;
4. Fixation of the inlay in the oral cavity	Glass ionomer cements (GIC) or zinc phosphate cement, glass, spatula, hydrogen peroxide, ether, cotton pellets	medical treatment of the tooth and inlay by generally accepted methods. Applying of cement on the surface of the inlay and into the tooth cavity.
5. Inlay rolling	Polishers	is carried out in 1-2 days after fixation.

Patterns of recommended sequence of activities: "Errors by making inlays, their causes and error elimination methods"

Errors	Causes	Elimination methods and preventive measures
I. Errors in cavity formation and inlay modeling		
1. Opening of the pulp chamber	the topography of the pulp chamber isn't taken into account the anatomical location of the pulp chamber	Take into account the safety zones. Use x-ray to determine the topography of the pulp.In class 5 cavities, the bottom should be spherical.
2. Fracture of the tooth wall during the formation of a cavity, modeling or fixation of the inlay	Preservation of a thinned enamel wall without dentin base. The fragility of the enamel in the pulpless tooth is not taken into account.	Remove the thinned walls without dentin base. If the wall breaks off, the cavity is subject to reshaping followed by the new modeling of the reproduction.
3. The wax model is not removed from the cavity.	The walls of the cavity are converged. Excessively deep well-shaped cavity. There are undercuts. The cavity is not hydrated. The pin is not hot enough.	Eliminate niches by expanding the cavity. Reduce them by expanding the cavity. Reduce the depth of the cavity by partial filling the bottom of it with cement. Create a divergence angle between 5 and 15 degrees. Moisten the cavity with water. Reheat the pin and fix it firmly in the wax without stirring.
II. Errors when fitting and fixing the inlay		
1. Inlays don't enter the cavity.	Incorrect insertion of the inlay into the cavity	The cavity should be formed asymmetrical.
	The wax was deformed during the removal from the cavity (pull-off, etc.).	The inlay is subject to remodeling.
	The presence of obstacles caused by casting defects (gas shells, joint fins, etc.).	Eliminate casting defects located on the surface of the inlay by grinding them.
	Having a well-shaped cavity, there is no release of excessive cement. Premature thickening of cement.	Create a notch on the lateral surface of the inlay to make the release of cement easier. The walls must diverge.
2. Between the edge of the cavity and the inlay, a strip of cement is visible.	Loose fit of the inlay to the edge of the cavity because of insufficient probing control. The surface of the inlay is higher than the surface of the tooth (especially often on the chewing surface).	Inlay extraction and remodeling. Grinding inlays (without violation of occlusal relationships) until the visible cavity with the cement disappears, followed by polishing.

SITUATIONAL TASKS

1. Patient K., 54 y. o., came to the clinic with complaints about the erasure of the tooth enamel. The patient has a history of bruxism. Objectively: the surface of the enamel of the teeth 13,12,11,21,22,23 in the area of the cutting edge is worn away. The bite is orthognathic. The other teeth are intact. Indicate the causative factor of enamel "wear". Form the diagnosis.

2. Six months ago, patient D. underwent therapeutic dental treatment of tooth 45 for complicated caries. Complaints about food getting stuck, unpleasant aching pain in the gums. When examining tooth 45, the following can be noticed: an amalgam filling, used for restoring a combined lesion of the occlusal and two approximal surfaces. There are no contact points in the area of tooth 45, the interdental gingival papilla is hyperemic and edematous. Give an assessment of the clinical situation. What methods of examination should be carried out for this patient?

3. A patient M. has a Black's class 1 cavity in tooth 46 with an index of the occlusal surface destruction that equals 0.3. After removing the softened dentin and creating parallel walls, painful probing of the cavity bottom and some discomfort when pressure is applied to the bottom of the cavity with a blunt instrument is noticed. Specify the topography of the defect. How to calculate TOSFI? What complications can appear during the manufacture of an inlay for this patient and what is the method of preventing such complications?

4. In patient N., after removal of necrotic tissues, the diagnosis is established: moderate caries in tooth 26 located in the center of the occlusal surface, with the affected area covering 50% of this surface. Tooth 26 is tilted buccally within 20°. Indicate the type of defect according to Kurlandzky's classification. Calculate IROPZ (integrated indicator of restorative potential). How should the cavity be prepared in this case?

5. After modeling the inlay using the direct method, the dentist was unable to remove the composite inlay from the cavity. What material is used in modeling inlays via the direct method? Name the causes of procedural errors. Describe your actions to correct these errors.

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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

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

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6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 2

Subject: Defects of the dental crown hard tissues. Artificial crowns.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To expand and reinforce students' knowledge and skills regarding methods of patient examination, diagnosis formulation, clinical stages of prosthodontic restoration with artificial crowns, and to improve their understanding of laboratory procedures involved in their fabrication.

Objectives of the lesson:

1. To teach students the general principles of patient examination when treating with artificial crowns (metal, plastic, metal-acrylic, metal-ceramic and metal-free).
2. To instruct students on the general principles of planning prosthodontic treatment using artificial crowns (metal, plastic, metal-acrylic, metal-ceramic and metal-free).
3. To familiarize students with the main types of artificial crowns (metal, plastic, metal-acrylic, metal-ceramic and metal-free) used in clinical practice for restoring hard tissue defects.
4. To inform students about indications and contraindications for the use of artificial crowns (metal, plastic, metal-acrylic, metal-ceramic and metal-free).

Class location: the clinical setting.

Practical skills mastered during the class:

Preparation of teeth for manufacturing metal-acrylic, metal-ceramic and metal-free bridge prostheses.

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.

Control questions from related disciplines:

1. Anatomy of the maxillofacial region.
2. Features of blood supply and innervation of the maxillofacial area.
3. Main anesthesia methods applied in prosthodontic dentistry during tooth preparation.

Requirements for the initial level of knowledge

To fully master the topic, students should review:

- Topographical features of crown defects.
- Characteristics of carious and non-carious lesions of hard dental tissues.

- Safety zones of dental hard tissues per N.G. Abolmasov and B.S. Klyuev.
- Anatomy of the teeth of the upper and lower jaw. Occlusion and articulation.
- Abrasive instruments for tooth preparation.
- Stages of taking an impression. Requirements of impressions and impression materials.
- Characteristics of the materials used for the manufacture of artificial crowns.
- Characteristics of the materials used for the fixation of artificial crowns.

Control questions:

1. Indications and contraindications for the manufacture of metal stamped crowns. Clinical and laboratory stages of manufacturing a metal stamped crown.
2. Indications and contraindications for the manufacture of plastic crowns. Clinical and laboratory stages of manufacturing a plastic crowns.
3. Indications and contraindications for the manufacture of metal-acrylic, metal-ceramic and metal-free crowns. Clinical and laboratory stages of manufacturing a metal-acrylic, metal-ceramic and metal-free crowns.
4. The sequence of teeth preparation for a cast-metal, metal-acrylic, metal-ceramic and metal-free crowns. Tooth preparation quality control.
5. Clinical and laboratory stages of manufacturing a cast-metal, metal-acrylic, metal-ceramic and metal-free crowns.

Artificial crowns are classified according to several criteria:

1. Purpose or function performed.
2. Structural features.
3. Material.
4. Manufacturing method.

Depending on the function they serve, crowns are categorized as:

– Restorative;
– Fixative;
– Supportive.

Based on structural features, crowns are classified as:

– Full;
– Half crowns;
– Three-quarter crowns;
– Equatorial crowns;
– Crown with a post;
– Crown on artificial abutment (abutment crowns).

Clinical and laboratory stages of manufacturing a metal stamped crown

Clinical steps	Laboratory steps
Step 1 Examination Establishing diagnosis The choice of prosthesis design Preparation (anesthesia if necessary) Taking impressions	**Step 1** Casting of tooth models and fixing them in the articulator Modeling of the tooth crown Taking a plaster stamp Taking a metal stamp Crown stamping (preliminary and final) Crown whitening

Step 2 Fitting the crown	**Step 2** Finishing (grinding and polishing) crowns
Step 3 Antiseptic treatment of the crown Crown fixation	

Methods for making plastic crowns

1. Clinical

Free form method (Акрилоксид, Акродент, виракрил)

- Matrix method (Акрилоксид, Акродент, Люксатемп)
- By standard celluloid caps (Люксатемп)

2. Laboratory

Free form method. The prepared tooth and the gum surrounding it are treated with an isolating agent. Knead the self-hardening plastic of the corresponding color in the crucible. After reaching the pasty stage, plastic is applied to the stump of the tooth and pressed tightly over it. The patient closes the jaws in the position of central occlusion. When the plastic reaches the rubber-like stage, it is carefully removed from the stump and the patient is asked to vigorously rinse his mouth, then the plastic is again placed on the tooth. The heating of the plastic indicates that the solid stage has been reached. After polymerization is completed, the plastic block is given an anatomical shape using milling cutters, carborundum heads, discs and polished with rubber wheels and brushes. Similarly, it is possible to make a temporary crown on a plaster model cast on an alginate impression obtained from a prepared tooth. This minimizes the harmful effect of the self-hardening plastic monomer.

Matrix method. Before preparation, a silicone impression is taken from the dentition. Having prepared the teeth, a self-hardening resin is kneaded and placed in the imprint of the prepared teeth. A spoon with an impression is placed on the dentition and held until the polymerization of the plastic is completed, then it is removed, the crowns are removed, identical in shape to the teeth before preparation, they are ground and polished.

By standard celluloid caps. The tooth is prepared for a plastic crown. A standard celluloid cap is selected and it is fitted. The prepared tooth and the gum surrounding it are treated with an isolating agent (Vaseline). After that, the cap is filled with quick-hardening plastic and placed on the tooth. After hardening of the plastic, the cap is cut and removed, excess plastic is removed, if any, and a crown is obtained.

Scheme: Gingival retraction methods

Mechanical:	**Chemical:**	**Surgical:**
retraction threads, retraction rings, temporary crowns	retraction fluid, eugenol containing materials for temporary fixation	coagulation, excision

Clinical and laboratory stages of cast crowns manufacturing

First clinical stage:

- examination of the patient, diagnosis, preparation of a treatment plan;
- preparation of abutment teeth;
- gum retraction;
- taking a working (two-layer) impression;
- taking an auxiliary impression of antagonist teeth;
- fixation of central occlusion;
- fabrication of temporary crowns.

First laboratory stage:

- casting of working and auxiliary models;
- mounting models in the articulator;
- modeling of crowns with wax;
- replacement of wax with metal;
- fitting on the model, grinding.

The second clinical stage: verification of the design of cast crowns.

The second laboratory stage: final processing of crowns (grinding, polishing).

The third clinical stage: fitting and fixation of finished crowns on the abutment teeth, recommendations for the patient on the care of prostheses.

Clinical and laboratory stages of manufacturing metal-acrylic crowns

First clinical stage:

- examination of the patient, diagnosis, preparation of a treatment plan;
- preparation of abutment teeth;
- gum retraction;
- taking a working (two-layer) impression;
- taking an auxiliary impression of antagonist teeth;
- fixation of central occlusion;
- fabrication of temporary crowns.

First laboratory stage:

- casting of working and auxiliary models;
- models mounting in the articulator;
- modeling of frameworks with wax;
- application of retention pearls on the facing material;
- replacement of wax with metal;
- grinding and polishing of the metal frame.

The second clinical stage:

- checking the design of the metal framework;
- determination of the color of the plastic facing.

The second laboratory stage:

- wax lining modeling;
- replacement of wax with plastic;
- grinding and polishing of lining.

The third clinical stage: fitting and fixation of finished crowns on the abutment teeth, recommendations for the patient on the care of prostheses.

Clinical and laboratory stages of manufacturing PFM crowns

First clinical stage:

- examination of the patient, diagnosis, preparation of a treatment plan;
- preparation of abutment teeth;
- gum retraction;
- taking a working (two-layer) impression;
- taking an auxiliary impression of antagonist teeth;
- fixation of central occlusion;
- fabrication of temporary crowns.

First laboratory stage:

- casting of working and auxiliary models;

- models mounting in the articulator;
- modeling of frameworks with wax;
- replacement of wax with metal.

The second clinical stage:

- checking the design of the metal framework;
- determination of the color of the facing.

The second laboratory stage: ceramic lining sintering.

The third clinical stage: verification of the design of a PFM crown.

The third laboratory stage: glazing and final processing of the PFM crown.

The fourth clinical stage: fitting and fixation of finished crowns on the abutment teeth, recommendations for the patient on the care of prostheses.

SITUATIONAL TASKS

1. After preparing the tooth for a metal crown, the tooth was removed from occlusion, shortened by one-third of the crown height along the chewing surface, and the medial surface was prepared at a 70° angle. What errors and complications can occur during tooth preparation? What is your approach?

2. After preparing the tooth for a metal crown, a gingival indentation appeared at the neck of the tooth. What is your approach?

3. A plastic crown was fitted on tooth 22, and the crown's color matched the natural teeth. During fixation, a color mismatch was noticed. What is your tactic in this situation?

4. Patient M. came with complaints about an aesthetic defect. During examination: tooth 21 is covered with a crowned veneer. The veneer color does not match the neighboring teeth. What is the mistake? What is your treatment plan?

5. During examination, an inconsistency in the anatomical form of the tooth was found under a metal-ceramic crown. What is the dentist's approach?

6. During examination, a mismatch in the color of the metal-ceramic crown with the natural teeth was detected. What is the mistake? What is your approach?

7. When determining the height of the artificial metal-ceramic crown on tooth 12, an overbite was observed during central occlusion. What is your approach?

8. Patient K. reported frequent loosening of a metal-ceramic crown on tooth 11. What could be the causes leading to this complication?

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

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6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 3

Subject: Defects of the dental crown hard tissues. Pin structures, cast post-and-core inlays.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To expand and reinforce students' knowledge and skills regarding methods of patient examination, diagnosis formulation, clinical stages of prosthodontic restoration with restorative pin structures, and to improve their understanding of laboratory procedures involved in their fabrication.

Objectives of the lesson:

1. To teach students the general principles of patient examination when treating with restorative pin structures.
2. To instruct students on the general principles of planning prosthodontic treatment using restorative pin structures.
3. To familiarize students with the main types of restorative pin structures used in clinical practice for restoring hard tissue defects.
4. To inform students about indications and contraindications for the use of restorative pin structures.

Class location: the clinical setting.

Practical skills mastered during the class:

Preparation of teeth for manufacturing restorative pin structures.

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 fully master the topic, students should review:

- Types of post teeth and their distinctive features.
- Rules for preparing the root canal for a post, possible complications during root canal obturation removal, and their prevention.
- Clinical and laboratory stages of manufacturing simple post teeth and Richmond, Ilyina-Markosyan, and Ahmedov post teeth.
- Advantages of abutment post constructions over post teeth.
- Clinical and laboratory stages of manufacturing abutment post constructions.

Control questions from related disciplines:

1. Morphological features of tooth tissues, as well as bone and soft tissues of the upper and lower jaws.
2. Physical properties of tooth tissues and jawbone tissues.
3. Clinical material science and laboratory techniques.
4. Treatment of caries and its complications, periodontal diseases.
5. Treatment of maxillofacial injuries.

Control questions:

1. Requirements for the condition of the root and surrounding tissues when creating a abutment post construction.
2. Indications for the use of abutment post constructions depending on the condition of the subgingival tissues, wall thickness, and bite type.
3. Provide a comparative characterization of abutment post constructions and post teeth.
4. Features of hard tissue preparation and root canal preparation for abutment post constructions.
5. Methods of manufacturing abutment post constructions, materials used in this process.
6. Elastic post constructions, indications for their use, materials used in this process, and features of root canal preparation.

Pin constructions:

- By materials: metal, ceramic, polymer, carbon, fiberglass, zirconium oxide.
- By manufacturing methods: standard and custom.
- By design: active and passive.
- By functional purpose: restorative and support.

Restorative pin-based dental prostheses are used to replace defects in the hard tissues of the tooth when other known restoration methods are unsuitable.

The pin is one of the main elements of a restorative pin-based dental prosthesis, providing fixation on teeth with various degrees of crown destruction.

According to the classification proposed by S. N. Parkhamovich, restorative pin constructions for dental prostheses used in the orthopedic treatment of hard tissue defects are divided into pin teeth, post pin systems, and restorations on pins.

A restorative pin construction is a non-removable dental prosthesis for restoring fractured hard tissues of a tooth. It consists of a pin, which is fixed either through adhesion with a bonding material (passively) or via mechanical retention (actively) in the tooth’s hard tissues, and the actual restorative part, which replaces or supports the missing part of the tooth.

Pin tooth — a non-removable dental prosthesis comprising a root part (the pin fixed in the root canal of a preserved root) and a crown part that fully restores the defect of the natural crown.

Post pin system — a microprosthesis designed to create a reliable connection between an artificial (supporting and restorative) crown or other covering structure and a preserved root.

In clinical practice, two variants of post pin systems are applied:

1. Post pin abutments.
2. Pin stumps (artificial root stumps with pins).

Post pin abutment — a non-removable microprosthesis intended to restore the root stump when various options of its preserved supragingival part are available. It recreates the shape of the

root stump to ensure the proper fabricate and retention of the covering prosthetic structure on the restored tooth.

Pin stump (artificial root stump with a pin) — a non-removable microprosthesis designed for a secure connection of a future artificial crown (covering structure) with a tooth root, the crown part of which is entirely destroyed.

The following post pin constructions are distinguished:

1. **Solid (integral)** — the pin and the root (abutment) parts are made as a single unit according to a pre-made reproduction or matrix. The post abutment or pin stump can be:
   - Cast from metal based on a custom-designed reproduction (e.g., cast post abutment);
   - Fabricated using precise milling based on a pre-made model (zirconia constructions);
   - Fully ceramic root stumps (casting ceramics, IPS Empress ceramic).
2. **Modular (assembled)** — parts of the pin system are made from homogeneous material, with at least one component fabricated from a custom-designed reproduction.
3. **Combined** — parts of the restorative pin constructions are made from different materials. These are formed directly, using standard root pins and restorative dental materials.

Cast post abutment — a type of root replica made by casting from metal based on a custom reproduction. Cast post abutments can be either integral or modular. Currently, cast post abutments are among the most common and effective support structures for preparing teeth with broken crowns.

The use of cast post abutments can be applied in various clinical situations, even when the root structure is weakened due to wall thinning or root destruction below the gum line.

In recent years, standard root pin systems have been widely used for rehabilitating teeth with broken crowns. The diversity of these systems and ignoring indications for their use often lead to improper application and negative treatment outcomes. Using standard root pins allows for single-session preparation of the root for a prosthetic crown.

Methodology of using a cast root post system for patients with complete absence of the tooth crown

Currently, the cast root post system is considered one of the most common and effective methods for restoring a broken tooth crown. Its use is possible even under challenging clinical conditions, such as when the root stump is disintegrated below the gum line.

Stages of manufacturing a cast root post system:

1. Root preparation for prosthetics.
2. Fabrication of the post abutment (by direct or indirect method).
3. Fit-up and fixation in the root canal.

Root preparation for a cast post:

- Remove decayed and soft tissues from the tooth.
- Then, open the root canal using a spherical bur № 1, followed by widening with a fissure or carbide fissure bur to about two-thirds of its length under control of a periapical radiograph.
- Modern tools like "Largo" or "Gates Glidden" drills are used for root canal preparation.
- After canal preparation, model the cast post abutment:
- Heat modeling wax ("Lavax") over a flame or in hot water, elongate and thin one end, then insert it into the root canal with slight pressure.
- Remove excess wax at the level of adjacent teeth.
- Model the root stump to resemble the anatomical shape of the target tooth.
- When modeling a wax stump for porcelain-fused-to-metal or plastic crowns, remove hard tissues of the root in the cervical area to a width of about 0.3–0.5 mm (circular shoulder).

SITUATIONAL TASKS

1. A 31-year-old patient T. complains of a break in the coronal part of tooth #12, previously treated for complicated caries. An X-ray shows a root canal filled incompletely on 2/3 length, with a periapical radiolucency of 1mm diameter. The bite is normal. The root remnant protrudes 1–2 mm above the gum. What is your approach? What prosthetic construction can be used?

2. Female patient A. reports frequent loosening of a plastic pin-anchored tooth #12, fabricated a year ago. The oral examination shows a plastic tooth attached to the root via a clamp wire pin. The X-ray shows a pin inside the root canal occupying half its length. The system is loose and easily removable. The hard tissues of the root have been ground down to the level of the gum at a right angle to the axis of the tooth. What are your recommendations for prosthetic treatment?

3. Female patient C., 25 years old, a teacher, seeks single-session correction of a defect caused by a break of tooth #12's crown. Objectively: the crown of tooth #12 is completely missing, the root is at the gum level and stable. Orthognathic bite. Radiographs show filling material throughout the canal and no pathological periapical changes. Name the prosthetic constructions suitable for single-session fabrication by the dentist. What materials can be used? Assess the prognosis of treatment with these constructions.

4. During fitting of the post abutment on tooth #12, the root fractured. What could be the causes? What is the clinician's approach?

5. A patient O. is in the stage of fabricating a post pin system for tooth #22. After removing 2/3 of the root canal filling, a wax model ("Lavax") was created. Upon removal, it was found that the pin length is only one-third of the root canal length. What could be the reasons for this complication?

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.
2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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LESSON 4

Subject: Partial defects of dental arches. Etiology, pathogenesis, classification, clinical manifestations, diagnostics of defects of dental arches.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To conduct an analysis of students' theoretical knowledge and practical skills in prosthetic treatment of partial tooth loss with fixed prostheses. To improve skills: patient examination, diagnosis, and determining indications for prosthetic treatment of patients with dental arch defects.

Objectives of the lesson:

1. To teach students the features of treating dental arch defects.
2. To familiarize students with the etiology and pathogenesis of dental arch defects.
3. To familiarize students with classifications of dental arch defects.
4. To acquaint students with possible clinical manifestations of dental arch defects.
5. To enhance skills: patient examination, diagnosis, and determination of indications for prosthetic treatment of patients with dental arch defects.

Class location: the clinical setting.

Practical skills mastered during the class:

Diagnosis and treatment planning for the patient.

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 fully master the topic, students should review:

- From anatomy: the anatomical structure of teeth, dental arches, and jaws.
- From histology: the structure of the oral mucosa and periodontium.
- From materials science: new technologies and modern construction materials used in the fabrication of fixed prostheses.
- From prosthetic dentistry (fixed prosthetics): partial edentulism, dental arch defects, principles of transmitting masticatory forces with various types of dental prostheses.

Control questions from related disciplines:

1. Methodology for patient examination.

2. Diagnosis formulation and justification.
3. Types of bite and their characteristics.

Control questions:
1. Etiology of partial tooth loss.
2. Pathogenesis of partial tooth loss.
3. Classification of dental arch defects (by Kennedy, Gavrilov, ICD-10).
4. Clinical presentation of partial tooth loss.
5. Treatment planning for patients with dental arch defects.

Tooth loss is considered a nosological form of disease of the maxillofacial system and is called secondary edentulism. Partial secondary edentulism, as an independent nosological form of the disease of the maxillofacial system, is defined by V.Yu. Kuryandsky as a fully compensated condition of the hard tissues and periodontium of preserved teeth with the presence of dental arch defects resulting from the removal of some teeth.

Secondary partial edentulism should be distinguished from primary, where the dental arch defect develops due to the death of the permanent tooth germs or they did not form as a result of anomalies in the development of the maxillofacial system.

Another nosological form of tooth absence in a decompensated state of the periodontium of the remaining teeth must also be identified — this is a complicated form of partial edentulism, or edentulism, which is a complication of periodontal diseases.

Scheme: Classification of Dental Arch Defects

Kennedy Classification by Types:
1. Bilateral distal defect of the dental arch.
2. Unilateral distal defect of the dental arch.
3. Included defect in the lateral regions of the dental arch.
4. Included defect in the anterior region.

Each class has subclasses, except for the last one.

Kennedy's Rule: If there are multiple defects in the dental arch belonging to different classes, the dental arch should be classified according to the lower (smaller) class number.

The classification proposed by Kennedy, characterized by certain logicality and simplicity of analysis, allows, depending on the type of defect, to determine the appropriate prosthetic design.

For the clinical approach discussed in this section—namely, uncomplicated partial secondary edentulism—this classification is of definite interest because it helps to identify the construction of a suitable dental prosthesis with a certain degree of certainty.

Included defects of the dental arch are clinical cases where the defect is bordered on both sides by teeth—for example, absence of two premolars or incisors, or central and lateral incisors.

E.I. Gavrilov's Classification by Groups:
1. Terminal defects of dental arches (unilateral, bilateral).
2. Included defects of dental arches (lateral — unilateral), bilateral, and anterior.
3. Combined.
4. Jaws with only preserved teeth.

International Classification of Diseases, 10th Revision (ICD-10):
Class XI. Diseases of the Digestive System (K00-K93):
- K00-K14 Diseases of the mouth, salivary glands, and jaws

- K00 Developmental and eruptive disorders of teeth
- K00.0 Edentulism
- K00.00 Partial edentulism (hypodontia) (oligodontia)
- K00.01 Complete edentulism
- K00.09 Unspecified edentulism

- K20-K31 Diseases of the esophagus, stomach, and duodenum
- K35-K38 Appendiceal diseases
- K40-K46 Hernias
- K50-K52 Non-infectious enteritis and colitis
- K55-K64 Other intestinal diseases
- K65-K67 Peritoneal diseases
- K70-K77 Liver diseases
- K80-K87 Diseases of gallbladder, biliary tract, and pancreas
- K90-K93 Other digestive system diseases

Regarding the treatment approach discussed in this section—for uncomplicated partial secondary edentulism—this classification is of particular interest, as it allows for an approximate determination of the prosthesis design.

Included defects of the dental arch are clinical cases where the defect is bounded on both sides by teeth—for example, missing two premolars or incisors, or a combination of central and lateral incisors.

Depending on the extent and topography of the defect (i.e., the number of missing teeth), the possibility of applying dental prostheses is evaluated.

Indications for fixed prostheses include treatment of partial secondary (and primary) edentulism in cases such as:

- Loss of one, two, three, or four incisors;
- Loss of canines;
- Loss of premolars on one or both sides of the jaw;
- Loss of two premolars and the first molar.

A rudimentarily developed third molar with poorly developed root system is contraindicated for fixed prosthesis use.

In such cases, the defect should be restored with removable prostheses.

SITUATIONAL TASKS

1. Patient X, 38 years old, consulted the clinic complaining of multiple dental arch defects, with no prior prosthetic treatment. Teeth 17, 15, 14, 11, 25, 26 are missing due to complicated caries. The rest of the teeth are intact and stable. The bite is orthognathic. Classify the defects according to Kennedy and Gavrilov.

2. Patient K, 32 years old, complained of pain and tooth mobility in teeth 21 and 26, which serve as abutments for a bridge prosthesis. During the interview, it was found that the patient is practically healthy. Teeth 23 and 24 were lost due to trauma. Seven years ago, a bridge was made on teeth 22 and 25, which became loosened after four years and were extracted. Later, a bridge was made on teeth 21 and 26. After two years, the patient noticed increasing mobility of the front tooth. The bite is orthognathic with deep overbite. The mucous membrane around teeth 21 and 26 is hyperemic and edematous. The bridge is mobile along with its abutments. R-ray shows resorption of the alveolar bone at tooth 21's socket (3/4 of its length) and widening of the periodontal space; tooth 26 shows resorption of half the socket's length and widening of the periodontal space. What is the cause of teeth mobility? What is the treatment plan?

3. Patient E, 34 years old, came with difficulty chewing due to missing lateral teeth in upper and lower jaws. History shows teeth 16, 25, 26, 36, 35, 45, 46 were extracted due to complicated caries over the past three years. No prior prosthetic treatment. On examination: mucous membrane is pale pink, bite is orthognathic, teeth 17, 15, 24, 27, 37, 34, 44, 47 are intact; percussion is painless, stable. Diagnosis? Methods of treatment and methods of jaw fixation in the centric occlusion position.

4. Patient B, 24 years old, complains of aesthetic issues and difficulty biting food. Examination shows the patient is generally healthy. Teeth 11, 21, 22 were extracted after trauma 30 days ago. Rest of the teeth are intact and stable. Bite is orthognathic; mucous membrane is pale pink. R-ray shows tooth 12's canal filled with root filling material up to the apex. No periapical pathological changes. Classify according to Kennedy and Gavrilov.

5. Patient N, 65 years old, complains of difficulty chewing due to prosthesis fracture of the upper jaw. Previously prosthetized multiple times; last prosthetic treatment was 7 years ago. On the upper jaw, tooth 23 is preserved; on the lower, teeth 33 and 34 are present; all others are absent. Classify according to Kennedy and Gavrilov.

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

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

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 5

Subject: Etiology, pathogenesis, clinical manifestations, diagnostics of partial anodontia.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To analyze students' theoretical knowledge and practical skills regarding orthopedic treatment of partial tooth loss with fixed prostheses. To improve skills in patient examination, diagnosis, and determination of indications for prosthetic treatment in patients with dental arch defects.

Objectives of the lesson:

1. To teach students the specifics of treating dental arch defects.
2. To familiarize students with the etiology and pathogenesis of dental arch defects.
3. To acquaint students with possible clinical manifestations of dental arch defects.
4. To enhance skills in patient examination, diagnosis, and determination of indications for prosthetic treatment in patients with dental defects.

Class location: the clinical setting.

Practical skills mastered during the class:

Medical documentation management.

Preparing the order slip during orthopedic consultation.

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 fully understand the topic, students need to review:

- Anatomy: structure of teeth, dental arches, and jaws;
- Histology: structure of oral mucosa;
- Materials science: new technologies and modern materials used in the fabrication of fixed prostheses;
- Orthopedic dentistry (fixed prosthodontics): partial edentulism, dental arch defects, principles of transmitting masticatory pressure with various types of dental prostheses.

Control questions from related disciplines:

1. Patient examination methodology.

2. Diagnosis formulation and justification.
3. Types of occlusion and their characteristics.

Control questions:

1. Clinical presentation of partial tooth loss during external examination.
2. Changes in the maxillofacial system with partial tooth loss.
3. Changes in the temporomandibular joint with partial tooth loss.
4. Secondary deformities of dental arches in partial tooth loss, pathogenesis, clinical features.
5. Treatment algorithm for patients with partial tooth loss, reduced lower face height, and secondary dental arch deformities.

Diagnosis of "partial edentulism"

It requires examination of the dental arches and each tooth individually. Teeth bordering the defect and initially considered as support for fixed prostheses must undergo radiological examination.

Support teeth for fixed prostheses can be either intact teeth with healthy periodontium or teeth with channels filled (endodontically treated). Teeth with chronic periapical processes, even if asymptomatic clinically or with incomplete root canal filling, cannot be used because additional load from the prosthesis may exacerbate the pathology. These teeth require re-treatment. Orthopedic treatment should commence at least one week after peri-apical therapy.

Assessment of reconstructed dental arches after partial tooth loss:

It is based on the absence of inflammation, dystrophic processes in the periodontal tissues, pathological wear of hard tissues, and deformities of dental arches (Popov-Godon phenomenon, tooth displacement due to periodontitis). If these pathological signs are present, the diagnosis changes accordingly. For example, when dental arch deformities are identified, a diagnosis of partial secondary edentulism complicated by Popov-Godon phenomenon is made, and the treatment plan and clinical management differ.

Defects in dental arches can be terminal, combined, or embedded.

Diversity of maxillofacial lesions:

They are highly varied, and no two patients have identical conditions. Key differences include: tooth shape and size, occlusion type, defect topography, periodontal status of remaining teeth, functional relationships within the dental arch groups, tissue resilience and pain threshold of alveolar ridges and hard palate, shape and size of edentulous areas, and overall and local pathological conditions influencing the course of the disease.

Each patient has individual features, so even two identical defects (by size and location) require different clinical approaches, as their etiology, clinical presentation, and prognosis may differ.

SITUATIONAL TASKS

1. Patient B., 37 years old. Complains of absence of molars 16, 17 in the upper jaw, difficulty chewing. Objectively: tooth 15 is stable, with a filling on the approximal surface; percussion sensitive. Tooth 18 is intact, percussion painless, crown well defined, stable. Diagnosis. Treatment plan.
2. Patient C., 45 years old. Seeks help for missing molars in the upper and lower jaws, difficulty chewing. Missing teeth: 16, 26, 27 in the upper jaw; 35, 36, 45, 46 in the lower jaw. Teeth 17, 15, 25, 27, 34, 37, 44, 47 are intact, percussion painless. A bridge prosthesis supported on teeth 17, 15, 25, 27, 34, 37, 44, 47 is proposed. Describe the sequence of the orthopedic dentist’s work with this patient. Assess the quality of the work.

3. Female patient A., 22 years old. Seeks consultation for aesthetic defect. Medical history reveals that tooth 12 was previously treated for chronic periodontitis. One year ago, she underwent root resection of tooth 12. A month ago, due to exacerbation of chronic periodontitis, tooth 12 was extracted. Objectively: mucosa near the extraction site shows no changes. Tooth 11 is intact, color unchanged, stable, painless on percussion. Tooth 13 has a filling on the distal surface, stable, painless on percussion. Diagnose. Treatment plan. Additional diagnostic methods.

4. Patient K., 27 years old. Consulted a dentist three days ago. Teeth 17, 15, 13, 23, 26, 28 prepared for supporting crowns; provisional prostheses made; impressions taken for upper and lower jaws. Describe the clinical and laboratory stages of fabricating fixed bridge prostheses. What should the dental technician prepare for the next visit?

LITERATURE

Basic:

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 6

Subject: Orthopedic treatment of patients with partial anodontia with fixed bridge prostheses.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To conduct an analysis and summarize theoretical knowledge and clinical skills on the topics: prosthetics of dental arch defects with various types of fixed prostheses; partial tooth loss with bridge prostheses.

Objectives of the lesson:

1. To teach students the features of treating dental arch defects.
2. To familiarize with the etiology and pathogenesis of dental arch defects.
3. To acquaint with possible clinical manifestations of dental arch defects.
4. To improve skills in patient examination, diagnosis, and determination of indications for prosthetic treatment in patients with dental arch defects.

Class location: the clinical setting.

Practical skills mastered during the class:

Preparation of teeth for the fabrication of metal-acrylic, metal-ceramic, and metal-free bridge prostheses.

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 fully master the topic, students should review:

- In anatomy: the anatomical structure of teeth, dental arches, and jaws;
- In histology: the structure of the oral mucosa;
- In materials science: new technologies and modern materials used in the manufacture of fixed prostheses;
- In prosthetic dentistry (fixed prosthetics): partial edentulism, defects of dental arches, principles of transmitting chewing forces with various types of dental prostheses.

Control questions from related disciplines:

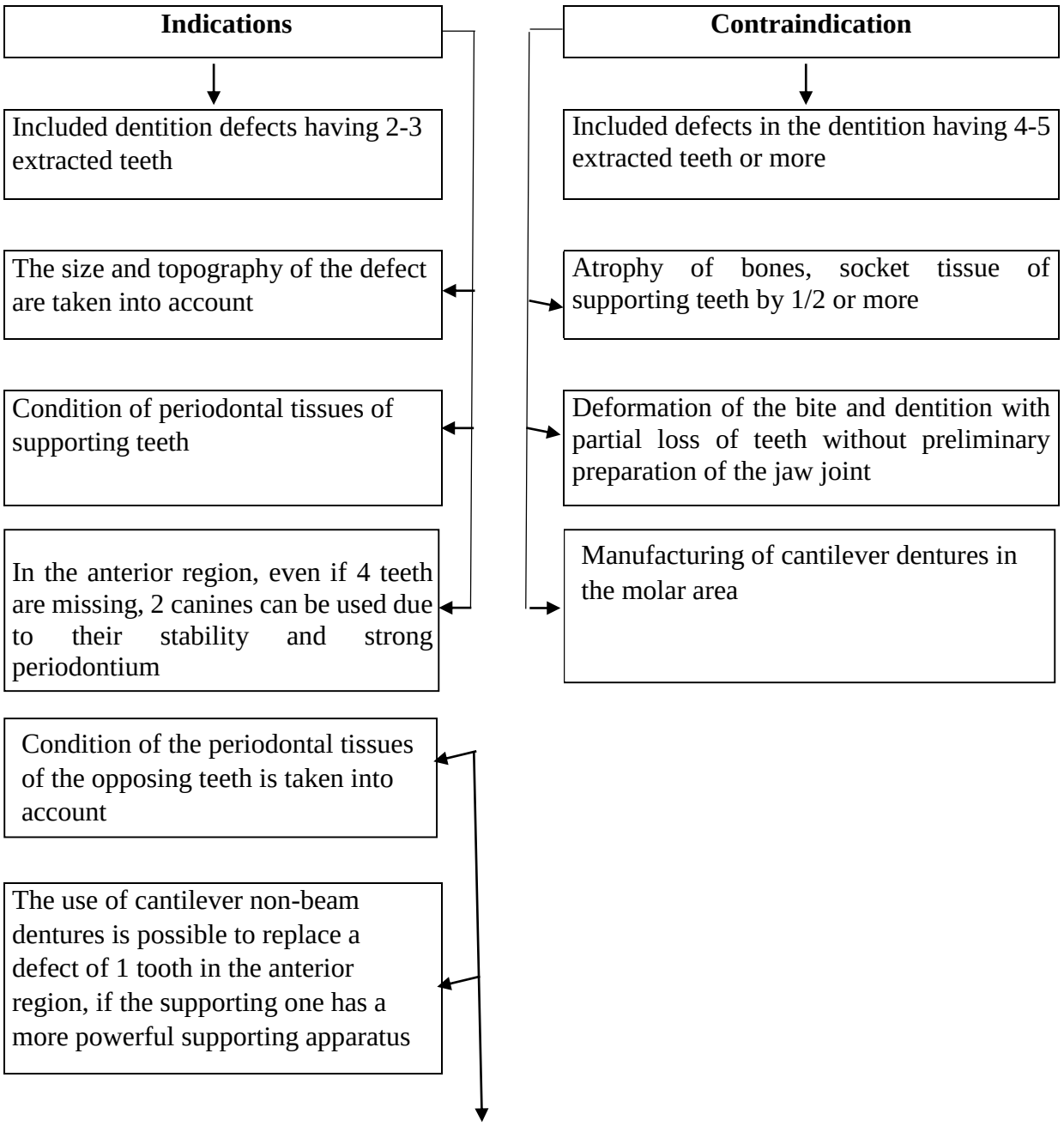
1. Methodology of patient examination.
2. Diagnosis and its justification.

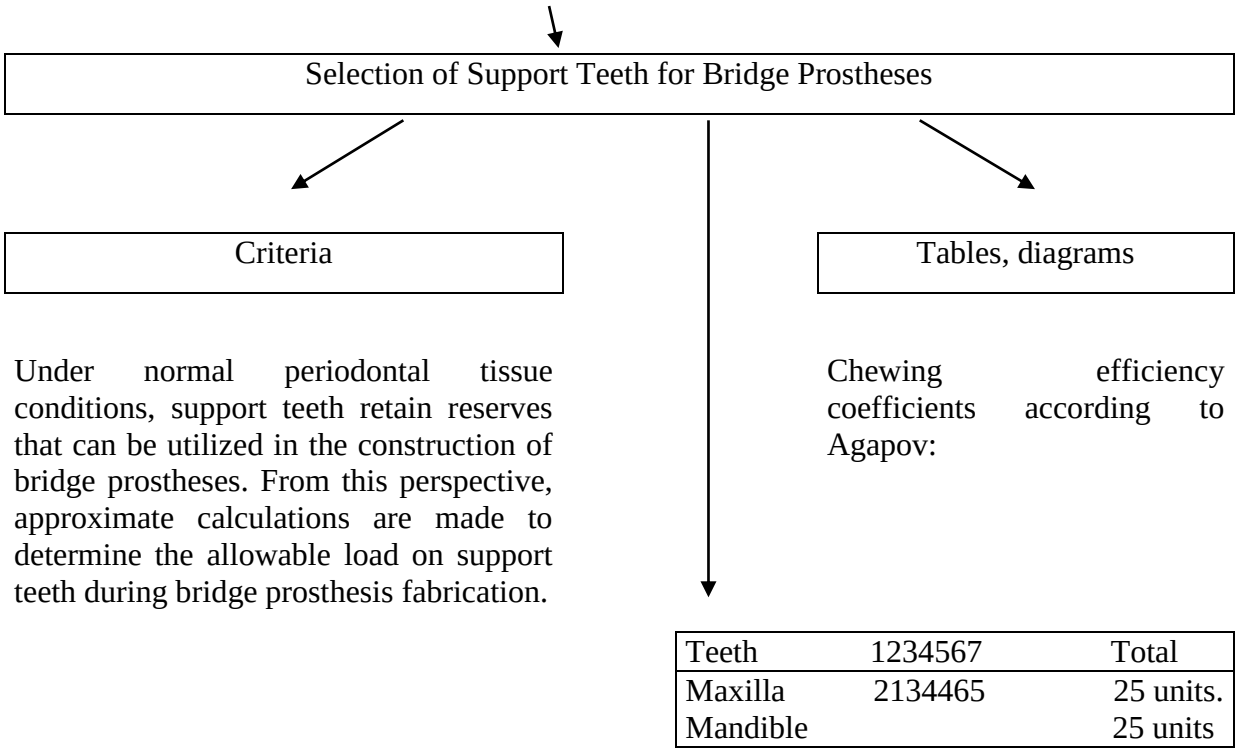
3. Types of occlusion and their characteristics.

Control questions:

1. Indications and contraindications for the fabrication of full-metal, M-A (metal-acrylic), M-K (metal-ceramic), B-M (bridge metal) bridge prostheses.
2. Principles of tooth preparation for the fabrication of full-metal, M-A, M-K, B-M bridge prostheses.
3. Methods of retraction and impression-taking, and the requirements for impressions when making bridge prostheses.
4. Clinical and laboratory stages of fabrication of full-metal, M-A, M-K, B-M bridge prostheses.
5. Criteria for assessing the quality of different bridge prosthesis constructions.
6. Rules of fixation for various bridge prosthesis designs.

Scheme: "Indications and contraindications for the use of bridges"





Teeth	1234567	Total
Maxilla	2134465	25 units.
Mandible		25 units

Relative contraindications for the use of metal-ceramic constructions

1. Teeth with a vital (intact) pulp in children under 16 years old, due to the age-related features of developing teeth (wide pulp chamber and proximity of pulp to the surface, broad dentinal tubules). Deep preparation of these teeth, especially when creating a circular ledge during the fabrication of metal-ceramic crowns, can lead to damage (thermal burn) and even pulpal necrosis with subsequent involvement of the apical periodontium.

2. Lower incisors and other teeth with thin, fragile crowns, where there is also a risk of pulp damage.

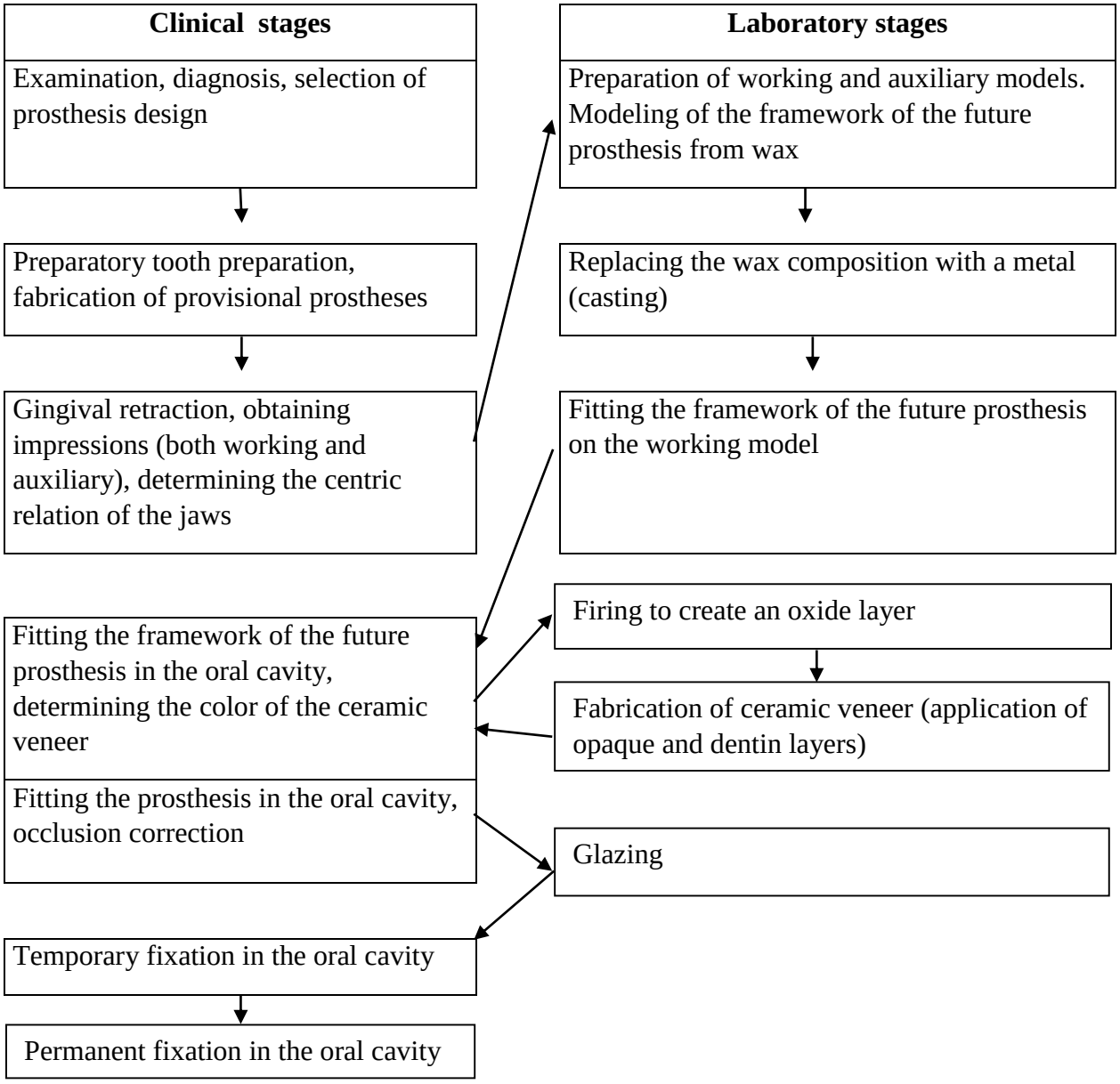
3. Deep occlusion, where lower incisors completely overlap upper incisors. The latter have an oral inclination and tightly contact the antagonists, covering them from the buccal side. They tend to have thin and often worn crowns on the occlusal surface. Under these conditions, it is impossible to grind them to the required depth or to create a gap between upper and lower incisors for the construction of a metal-ceramic crown. Increased load on these teeth during anterior and transverse occlusions can lead to various complications.

4. Pathological wear of tooth hard tissues and decreasing bite height. When metal-ceramic restorations are applied on anterior teeth without prior appropriate orthodontic preparation (bite rebuilding and masticatory reflex correction), chewing pressure is transmitted through these crowns, which may cause their fracture.

5. Bruxism and other parafunctions of masticatory muscles characterized by high muscle excitability, teeth clenching, or lateral displacements of the mandible when the dental arches are clenched. Using metal-ceramic crowns in patients with such parafunctions may cause them to break or overload the support teeth and their antagonists.

6. Diseases of marginal periodontium. Since porcelain is almost non-wearable, patients with metal-ceramic crowns may experience functional overload of the teeth. This is especially dangerous if marginal periodontal disease is present, as additional excessive load on support teeth or their antagonists can exacerbate and worsen the pathological process.

Scheme: "Sequence of clinical and laboratory stages for making metal-ceramic bridge prostheses"



SITUATIONAL TASKS

1. Patient A. came with a complaint about food getting between the fillings in the lower right teeth. Objectively: the dental arches are preserved, the defect of the distal wall of tooth 46 has been restored with a cement filling extending to the biting surface; the masticatory cusps are preserved. There is no contact point between the filling and the proximal surface of tooth 47, which is covered with a gold crown. The radiograph shows tooth 46 with a preserved pulp chamber, and a deep cavity. How should the restoration of the contact point be approached?

2. Patient L. complains of food retention between the upper left teeth, causing him to constantly use a toothpick after meals. This leads to the falling out of a filling and frequent visits to the therapist. Objectively: there is no contact point between teeth 27 and 28 of the upper jaw. On the distal surface of tooth 27, there is an unrestored cavity with softening of the hard tissues. The mesio-proximal surface of tooth 27 has been restored with a cement filling. The radiograph shows a deep cavity in tooth 27 and a pathological periodontal pocket between teeth 27 and 28. How should the restoration of the hard tissues in tooth 27 be approached?

3. Patient R. came with complaints of the lack of a firm occlusal contact between a prosthesis and the antagonist tooth 27. Objectively: a steel bridge prosthesis supported on teeth 25 and 27 of the upper left jaw. There is a 1.5–2 mm gap between the prosthetic body and the antagonist tooth in the centric occlusion position. The occlusal surface of tooth 36 is restored with a cement filling; the side walls are preserved; the contact point with neighboring teeth is intact. The radiograph shows a deep cavity in tooth 36, with thin walls. How should the restoration of a firm occlusal contact with the antagonist tooth be approached?

4. Patient Sh. consulted a prosthodontist based on the advice of a therapist for crown fabrication. Objectively: there is a defect in the hard tissues of tooth 46 with simultaneous involvement of the occlusal and proximal surfaces, restored with a cement filling; the cusps are not preserved. The radiograph shows the tooth is vital, with a deep cavity and the proximal surface below the gingival level. Do you agree with the treating doctor's opinion? What treatment plan should be adopted? Describe the procedures involved in performing the chosen restoration to fill the defect.

5. Patient B. presented with complaints of uncomfortable sensations in the mouth after gold bridge prosthesis fabrication. Objectively: the dental arch has been restored with a bridge supported on teeth 14 and 17 of the upper jaw. The lower dental arch is preserved. The opposing tooth (tooth 46 in the lower jaw) has an occlusal-proximal cavity restored with amalgam, which often falls out. The tooth has a vital pulp, a deep cavity, and the oral wall is thinned. Provide a provisional diagnosis. Justify your choice of treatment method, and specify the procedures involved in executing the selected restoration.

6. Patient V. complained of a defect in a gold crown on a bridge prosthesis and pain in the tooth while eating. Objectively: the lower dental arch is restored with a bridge supported on teeth 34 and 37. There is wear on the supporting crown of tooth 34 and formation of a medium-deep cavity in the hard tissues. The bridge is firmly cemented; the supporting crowns meet clinical requirements. Indicate the diagnosis and the physician's management plan.

LITERATURE

Basic:

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

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6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 7

Subject: Orthopedic treatment of patients with partial anodontia with 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	**58**
6.	Final stage	**13**

Purpose of the lesson: to analyze students' theoretical knowledge and practical skills in prosthetics for partial secondary edentulism using removable plate prostheses. To improve skills in patient examination, diagnosis, indication determination for prosthetics with removable prostheses, identifying the structural features of partial removable prostheses, and conducting clinical procedures; to reinforce knowledge of laboratory stages.

Objectives of the lesson:

1. Teach students the specifics of treating defects in dentate arches.
2. Familiarize with the etiology and pathogenesis of denture defects.
3. Introduce possible clinical manifestations of denture defects.
4. Enhance skills in patient examination, diagnosis, and indication determination for prosthetic treatment of patients with denture defects.

Class location: the clinical setting.

Practical skills mastered during the class:

- Determining and recording the centric relation of the jaws when fabricating removable prostheses.

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 fully understand the topic, students should review:

- Anatomy: the anatomical structure of teeth, dental arches, and jaws.
- Histology: structure of the oral mucosa.
- Materials science: new technologies and modern structural materials used in fabricating removable prostheses.
- Orthopedic dentistry: partial edentulism, denture defects, principles of transmitting masticatory pressure with different types of removable dentures.

Control questions from related disciplines:

1. Patient examination methodology.
2. Diagnosis formulation and justification.
3. Types of occlusion and their characteristics.
4. Physicochemical properties of plastics used in dental prosthetics.
5. Polymerization modes, types of porosity in plastics, and changes occurring in plastics when polymerization modes are violated.

Control questions:

1. Indications and contraindications for using removable plate prostheses in partial tooth loss. Characteristics of partial removable prostheses and their structural elements.
2. Methods of fixing and stabilizing plate prostheses. Clasp line and its significance for prosthesis fixation. Boundaries of the plate prosthesis and dependent conditions.
3. Clinical and laboratory stages of making partial removable prostheses.
4. Determining the centric relation of the jaws. Methods for determining the lower face height. Clinical guidelines for selecting and mounting teeth.
5. Inspection of partial removable prosthesis structures. Possible errors.
6. Preparation and polymerization modes of base plastics. Casting pressing technique and its features.
7. Fitting and placement of removable prostheses. Patient adaptation mechanisms. Instructions for patients on usage rules and hygienic care of partial removable plate prostheses. Rules for prosthesis adjustments.

LDS «Elements of Partial Removable Plate Prosthesis»

Components of the Prosthesis	Purpose	Variety	Materials
Clasps	Retention and stabilization of the removable prosthesis; splinting of teeth in periodontal diseases	By location: tooth, tooth-gum, gum; By shape: round, semicircular, pellets; By tooth coverage: single-arm, double-arm, clasped, multi-link	Metal, cast from Co-Cr alloys or gold-containing alloys; Metal, bent from orthodontic wire (stainless steel); Plastic made of polyoxymethylene (polyformaldehyde) (Dental D, QuattroTi); Gum clasps and pellets based on polymethyl methacrylate (Etakril, Fluorax
Base and artificial gum	Foundation for placing all elements of the prosthesis and transferring chewing pressure to the mucosa of the alveolar ridges	Plastic - single-layer, double-layer; Metal - cast or stamped; Combined plastic base reinforced with cast or stamped metal mesh	Artificial gum - plastic based on polymethyl methacrylate. Base can be plastic (polymethyl methacrylate, polyoxymethylene) or metal cast from Co-Cr alloys, gold-containing alloys, stamped from stainless steel
Artificial teeth	Chewing function, aesthetics, speech	Plastic, porcelain, metal, and combined	Plastic, composite, porcelain, gold alloys, steel

Methodology for determining central occlusion and clinical landmarks in case of partial absence of teeth

Position of antagonist teeth - (relationship of dental arches)	**Means of action**	**Execution method**
1) Along a triangle.	Wax bases are not used	Models are compiled based on tubercle-fissure contacts of antagonists
2) Only on two or one side.	A wax base is made for a jaw with a large number of missing teeth. Obtaining gypsum blocks	Models are compiled according to the imprints of teeth on the rollers or according to the relationship between the tubercle-fissure contacts of the antagonists.
3) There are no opposing teeth.	Bases are made for both jaws	Determination from the height of the lower part of the face and the central relationship of the jaws. Fixation of the central relationship of the jaws using rollers.

Morphological and physiological signs, landmarks and elements of artificial occlusion

Signs	**Landmarks**	**Elements**
1. Pupillary line, wings of the nose, Camper's horizon.	Occlusal plane.	Symmetrical occlusal surface of the dentition.
2. Physiological rest.	Height of the lower part of the face on the occlusal ridges.	The height of the lower part of the face on artificial teeth.
3. Functional activity of the lips, anatomical and topographical features of the jaws.	Level of the upper and lower - bite ridges.	Length of upper and lower teeth.
4. Configuration of the face, - interpalveolar angle.	Relief of the vestibular surface of the bite ridges.	The position of the teeth is in the tibular direction.
5. Central-occlusal position of the articular heads, symmetrical tension of the masticatory muscles.	Central occlusion of wax ridges, uniform contact of occlusal ridges, absence of deformation of the wax base.	Central occlusion of artificial dentition.
6. Midline of the face.	Aesthetic center on the occlusal ridges.	Aesthetic center of artificial dentition.

Signs	Landmarks	Elements
7. Lines of the corners of the mouth, width and length of the face.	Fang lines.	The location of the cutting cusps of the canines.
8. Active movement of lips when talking and smiling.	Smile line.	The location of the necks of - artificial teeth.
9. Patient's age, complexion and hair.	Color of natural teeth.	Color of artificial teeth.
10. Type, width and length of the patient's face, its position .	Shape and arrangement of - natural teeth.	The shape of the dentition, the location of artificial teeth.

Errors at the checking stage of partial plate denture

Medical errors	Clinical manifestations	Elimination methods
Understatement interalveolar heights	On external examination - an senile face, its lower third is reduced, nasolabial folds are pronounced, the chin is pushed forward, the red border of the lips is reduced	The wax plate is heated, applied to the artificial teeth of the lower jaw and the required height of the lower part of the face is restored with the help of this plate. The teeth are set again in the laboratory
Overstatement interalveolar heights	Tension of the soft tissues of the face during external examination, smoothness of the nasolabial folds. In the oral cavity - dense fissure-tubercle contact of teeth, teeth chattering when talking	The technician makes wax templates with bite ridges, the doctor again determines the interalveolar height and fixes the position of the jaws in central occlusion at the desired height
Lower jaw displacement:	In the oral cavity when closing the jaws prognathic relationship of dentition	Making a new wax base with occlusal ridges, repeating the stage of defining and fixing the jaws in the position of central occlusion
• *forward;*	– " –	– " –
• *left, right*	– " –	– " –
Deformation of the upper and lower wax templates	Increased bite with uneven and vague cuspal contact of the lateral teeth, gap between the anterior teeth	The technician makes a new template with bite ridges, the doctor again determines the central occlusion

SITUATIONAL TASKS

1. The patient K. has the following dental formula:

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

4 4 4 4 0 0 0 0 0 0 0 0 4 4 4 4

Make a diagnosis. How is the load distributed during the chewing act, and what complications may arise from the temporomandibular joint (TMJ)?

2. The patient A. was examined, and it was found that there are teeth on both jaws, but there are no antagonists. The doctor checked the correctness of the lower face height in the central occlusion position and established that it is 8 mm less than the height in the physiological rest position. What is the error committed?

3. The patient K. has the following dental formula:

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

4 4 4 4 4 0 0 0 0 0 0 0 4 4 4 4

During an occlusion check of removable prostheses between the artificial teeth, a spatula could be freely inserted. What is the reason for this error? What is the doctor's tact during this situation?

4. After fitting a partial removable plate prosthesis on the upper jaw, patient A. reports feeling that their cheek is bitten during eating. Name possible causes of these complaints and the doctor's approach.

5. The patient D. has the following dental formula:

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

4 4 4 4 4 0 0 0 0 0 0 4 4 4 4 4

Upon checking the prosthesis structure in the oral cavity, the anterior teeth are in occlusion, but there is a gap in the molar region. What is the cause of this error?

6. The patient B. has been using partial removable prostheses for 3–4 days. Complains of pain under the basis of the prosthesis. Objectively: pressure sores in the area of the upper lip frenulum and tongue frenulum, in the retromolar region. Make a diagnosis and determine the doctor's tactics.

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 8

Subject: Orthopedic treatment of patients with partial anodontia with removable dentures. Clasp 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	**58**
6.	Final stage	**13**

Purpose of the lesson: To analyze students' theoretical knowledge and practical skills in partial secondary edentulousness prosthetics using clasp dentures. To improve skills in: patient examination, diagnosis, indication determination for clasp denture prosthetics, identification of construction features of clasp dentures, conducting clinical procedures; to reinforce knowledge of laboratory stages.

Objectives of the lesson:

1. To teach students the specifics of treating dental arch defects.
2. To familiarize with the etiology and pathogenesis of dental arch defects.
3. To familiarize with possible clinical manifestations of dental arch defects.
4. To enhance skills in: patient examination, diagnosis, and determination of indications for prosthetics in patients with dental arch defects.

Class location: the clinical setting.

Practical skills mastered during the class:

Selection of construction and supporting elements of clasp dentures.

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 fully master the topic, students should review:

- From anatomy: the anatomical structure of teeth, dental arches, and jaws;
- From histology: the structure of the oral mucosa;
- From material science: new technologies and modern structural materials used in removable prosthetics;
- From prosthodontics: partial edentulousness, dental arch defects, principles of transmitting masticatory forces by different types of removable dentures.

Control questions from related disciplines:

1. Methodology of patient examination.
2. Diagnosis formulation and justification.

3. Types of occlusion and their characteristics.

4. Physicochemical properties of plastics used in dental prosthetics.

5. Polymerization modes, types of porosity in plastics. Changes in plastics caused by deviations from the polymerization mode.

Control questions:

1. Medical-biological fundamentals of clasp denture treatment, their characteristics. Constructive elements of clasp dentures.

2. Clinical indications and contraindications for fabricating clasp dentures.

3. Parallelogrammeter: methods of parallelogrammetry.

4. Ney's clasp system: selection of clasps depending on the placement of the interfacial line.

5. Clinical and laboratory stages of casting full-metal clasp dentures on refractory models. Equipment and materials necessary for their fabrication.

6. Manufacturing full-metal clasp dentures using attachment systems. Types of attachments, clinical conditions for their application.

Study of the model in the parallelogram

Student Actions	Means of action	Methodology and control criteria
Casting of the working model	Grinder, large size carborundum discs, plaster knife	The impression is filled with super gypsum until the denture bed is covered. The base of the model is cast with normal gypsum. The base of the model must be trimmed with a plaster knife until it is fully hardened. The final trimming of the plinth is carried out in a special apparatus, which is a grinding machine with a large-diameter abrasive disc attached.
Learning a model in a parallelogram: basic rules of parallelogrammetry	Parallelometer	Parallelometer in the fabrication of braces is necessary to determine the methods of fixation of the braces; to draw an equatorial line on the supporting teeth, which allows to find the supporting and retention surfaces for the location of the clamp arms; to create an artificial parallelism of the teeth. 1. The parallelometer provides the final determination of the design of the bracket prosthesis, 2. The overall clammer line, although curved, should be generally parallel to the occlusal plane. 3. The prosthesis should transmit masticatory pressure along the tooth axis when fixed in the oral cavity. 4. The denture must be designed to distribute the masticatory pressure rationally between the remaining teeth and the alveolar processes.
Mounting models on the articulated table	Parallelometer, working model	1. The working model of the jaw is placed on the rotating platform of the parallelogram table. To the middle of the chewing surfaces of the supporting teeth, 5 cm long metal rods are attached with sticky wax so that they are extensions of their vertical axes.

Determination of the insertion path according to the Novak method There is also a method of determining the path of insertion of the prosthesis according to Berezovsky S.S., which consists in determining the average inclination of the long axes of the supporting teeth by finding the bisector of the angle. The method of selection, in which the inclination of the model allows to find the most rational type of clammer for each supporting tooth and to arrange its elements in functional and aesthetic terms.	Working model fixed on the articulated table	1.Use an analytical rod to transfer the axes of the supporting teeth on one side to the lateral surface of the model base. Two lines are drawn parallel to the base of the model, which are at the greatest distance from each other until they intersect with the vertical axis lines of the teeth. 2. Divide each of the horizontal lines in half and, by connecting their centres, obtain the average axis of inclination of the supporting teeth on one side. 3.This line is transferred to the posterior surface of the model base using an analytical rod. 4. If there is one support tooth on the opposite side, its axis is immediately transferred to the rear surface of the base of the model, if there are two, then do the same as in the previous case. 5. On the posterior surface of the base of the model, the lines of the average axes of the inclination of the supporting teeth on both sides are connected by two parallel lines, divided in half and the points obtained are connected. In this way, the average inclination axis for all the supporting teeth on both sides is obtained. 6. The analytical rod of the parallelogram is aligned with the obtained average axis of inclination and thus the inclination of the model is obtained, at which parallelogrammetry is performed, for which the analytical rod is changed to a graphite rod. 7. The reference teeth are delineated with the graphite rod, obtaining the boundary line
Measurement of the depth of the undercuts of the supporting teeth to determine the location of the end of the retention arms of the clasps	Calibres with measuring disc diameter: No. 1 -0.25 mm No. 2 - 0.5 mm No. 3 - 0.75 mm	1. Select the calibration rod for the desired type of clamp according to the recommendation of the authors of the NEJA system. 2. Bring the calibration rod to the tooth so that its stem touches the equator of the tooth, then the disc of the rod will indicate the point where the end of the retention clamp should be located.
Pencil drawing of the future brace framework	Model, a chemical pencil	Release the screws securing the working model on the hinge table and cast the occluder model in the central occlusion position. The framework of the brace is drawn out.

Checking the Framework of a Removable Prosthesis in the Clinic

Action Steps	Means of Action	Criteria and Means of Control
Checking the framework of a removable prosthesis on the dental model		
1. Prosthesis framework: – Borders	Models of the jaws with partial tooth loss in the occlusal register with the bar-removable prosthesis framework	The framework must conform to the borders outlined by the doctor. It should be stable on the model and not sway.

– Position of the arc and saddle		– Arc on the upper jaw | The upper jaw arc is offset by 0.5 mm, width 8–10 mm, thickness 0.9–1.2 mm – Arc on the lower jaw | The lower jaw arc is offset by 0.5 mm, width 2–3 mm, thickness 1.5–2.0 mm – Placement | Located midway between the roots of natural teeth and the transition fold. There should be space for plastic underneath the meshwork. |
2. Clamps (Clamps): – Correct manufacturing		The clamp should have a shoulder, body, and projection.
– Clarify the position of clamp elements		
– Shoulders		The stabilizing part of the clamp on the supporting tooth should be above the line of sight on the lower jaw and below on the upper jaw. The retentive (fixing) part of the clamp should be below the line of sight on the lower jaw and above on the upper jaw.
– Occlusal pad		Positioned on the chewing surface of the tooth in fissures or artificially created depressions
Checking the framework in the oral cavity		
Quality control of the framework fabrication – Clamps	Prosthodontic mirror	The inner surface of the clamps facing the tooth should not have burrs or pores. Edges and ends of the clamp must be rounded.
– Arcs		– Should be free of foreign inclusions and pores, with appropriate thickness and width.
Fixation of the framework on the supporting teeth in the oral cavity: – Shoulders		Carefully fix the framework onto the supporting teeth without force. No swaying of the framework. It should pass with slight effort and hold tightly along the entire length of the tooth.
Occlusal pads		Should be positioned on the chewing surface of the supporting tooth in fissures or artificially created depressions, fit tightly, and not elevate the bite.
– Saddles		– Should have enough space for plastic
Relationship of the dental arches in the central occlusion	– Occlusal pads	Should not raise the bite or hinder mandibular movements.
Identify errors (if any were made) and correct them**	– Occlusal pads	If the occlusal pad raises the bite, determine the point of elevation with copying paper and grind it down. If the fixation of the framework is poor or it does not meet the requirements, the framework must be remade.

Algorithm of actions when checking the design of a frame denture

Stage	Criteria and means of self-control
Check all structural elements of the frame denture on jaw models	
Prosthesis base: - density of fiting of the base	The base of the prosthesis should not balance on the model and fit tightly to the alveolar process;
- borders	Must match the boundaries marked by the doctor. The base must correctly repeat the contours of the prosthetic bed. There should be no pores, cracks, or defects in the plaster models.
Clasps: -correct the position of clasps elements	All elements of the frame denture must comply with the boundaries recommended by the doctor.
- shoulders	On the supporting tooth, the fixing part of the clasp is located in a niche between the line of sight and the neck of the tooth.
- occlusal pad	Located in fissures or artificially created depressions.
Arrangement of artificial teeth: -relationship with antagonist teeth	Dense multiple contact of all teeth (in the area of chewing teeth, fissure-tubercular closure)
- the shape of the relationship between the dental arches (bite)	Depends on the bite or the relationship of the alveolar processes of the patient's jaw
- положение каждого зуба к альвеолярному отростку	The vertical axis of each tooth should correspond to the middle of the alveolar process
The position of each tooth in relation to the rows of standing teeth	There must be close contact between natural and artificial teeth.
Check the design of dentures in the oral cavity	
Correct position of clasps on supporting teeth	No balancing of the prosthesis, good fixation, clasps tightly grip the teeth.
- occlusal pad	Located in fissures or artificially created depressions, tightly adjoining the surface of the tooth;
- frame of denture	It is located 0.5 mm away from the mucous membrane on the upper jaw and 0.5-1.5 mm away from the mucous membrane on the lower jaw, depending on the shape of the slope of the oral surface of the alveolar process.
Tightness of fitting to alveolar prosess	The edge of the base along the periphery should fit tightly to the mucous membrane of the prosthetic bed; lack of balance of the base.
Clarify the boundaries of the basis	The base must follow the contours of the prosthetic bed (indicated by the doctor).
Relationship of dental arches in central occlusion	Tight closure of teeth throughout
Check the height of the lower part of the face with the teeth closed	Tight closure of natural and artificial teeth (no gaps between natural teeth).
Check the implementation of aesthetic guidelines for the arrangement of teeth: - shape and color of teeth	Must match remaining natural teeth
Check the phonetic correctness of the placement of the arcs: lower arc, upper arc	When speaking, it should not hinder the movement of the tongue.

Identify errors if they were made at the stage of determining the central relationship of the jaws and eliminate them	Dental occlusion disorders. Eliminate them in the clinic, assign the patient for a repeat check of the denture design.

SITUATIONAL TASKS

1. Patient K., 50 years old, dental formula:

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

Remaining teeth are stable; teeth 34 and 44 have extensive fillings, are discolored, and percussion is painless. According to the patient, teeth 34 and 44 were treated for complicated caries four years ago, with no complications reported since. The alveolar ridges are well expressed, and the lingual surface of the alveolar crest behind the anterior teeth slopes posteriorly. The frenum attachment is low. Determine the diagnosis considering the Kennedy classification, develop a treatment plan, and justify the choice of the denture design.

2. Patient V., 47 years old, dental formula:

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

Teeth bordering the defect are stable, have a proper anatomical shape, high clinical crowns, are intact. The alveolar process atrophy is minor; the tubercle is of medium size, and the palate height is moderate. The anterior third of the hard palate has a small torus.Determine the diagnosis considering the Kennedy classification, develop a treatment plan, and justify the choice of denture design.

3. Patient A., 43 years old, dental formula:

18 17 16 15 14 13 12 11
48 47 46 45 44 43 42 41
21 22 23 24 25 26 27 28

Remaining teeth have high clinical crowns, proper anatomical shape, and are intact. The alveolar ridges are minimally atrophied. The lingual surface of the alveolar crest behind the anterior teeth is vertical. The patient has a high frenum attachment of the tongue, and exostoses are sharply pronounced. Determine the diagnosis considering the Kennedy classification, develop a treatment plan, and justify the choice of denture design.

4. Patient V., 44 years old, dental formula:

18 17 16 15 14 13 12 11
48 47 46 45 44 43 42 41
21 22 23 24 25 26 27 28

Remaining teeth are stable; teeth 34 and 44 are rotated around the vertical axis; tooth 38 has a medial tilt. The edentulous alveolar process on the right is moderately atrophied and evenly shaped. Propose a suitable arch prosthesis design, justify the choice of denture design.

5. During study of the model with a parallelo-meter, a diagonal arrangement of the intermaxillary line was observed (high in the near zone and lowered in the distal zone) on the supporting teeth.Suggest the type of clasp system Neya.

6. On studying the model with a parallelo-meter, on premolars bordering the terminal defects that have a lingual tilt, a high position of the intermaxillary line on the lingual surface and a low position on the vestibular surface were observed.Choose the type of Neya clasp system construction for fixing the arch prosthesis.

7. Observation with a parallelo-meter shows different positioning of the intermaxillary line on the oral and vestibular surfaces of the tooth: on the oral surface – close to the typical, on the vestibular surface – diagonal.Propose the type of Neya clasp system for fixing the arch prosthesis.

8. Examination of a lower arch bar prosthesis revealed a high elasticity of the arch even with slight attempts to bring the terminal edentulous spaces together.What caused the undesirable elasticity? Is it possible to fit the patient with an arch prosthesis?

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 9

Subject: Orthopedic treatment of patients with complete anodontia.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To analyze and deepen students' knowledge of the features of special preparation of the oral cavity for prosthetics in cases of complete tooth loss, as well as fixation and stabilization of dentures. To systematize knowledge of methods of fixation and stabilization of complete removable plastic dentures, and the skills of selecting methods for special preparation of the oral cavity for prosthetics in cases of total tooth loss.

Objectives of the lesson:

1. Reinforce knowledge of dental patient examination.
2. Systematize knowledge about the features of preparing the oral cavity for prosthetics with complete dentures.
3. Reinforce understanding of fixation methods and factors influencing the stabilization of complete removable dentures.
4. Acquire practical skills in diagnosing patients indicated for complete removable denture prosthetics.

Class location: the clinical setting.

Practical skills mastered during the class:

Diagnosis and treatment planning for the patient.

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 fully master the topic, students should review:

- Anatomy: The anatomical structure of the maxilla and mandible at different ages and after tooth loss; the anatomical and histological features of the oral mucosa.
- Materials science: Materials and laboratory techniques for making dentures.
- Radiological diagnostics: Methods of radiological examination of the dentoalveolar system.

Control questions from related disciplines:

1. Anatomical structure of the maxilla.
2. Anatomical structure of the mandible.
3. Histological structure of the oral mucosa.
4. Functional and morphological changes in the dentoalveolar system during total tooth loss.
5. Masticatory muscles: characteristics and attachments.

Control questions:

1. Etiology, pathogenesis, and clinical features of complete edentulism. Changes in the dentoalveolar system during complete edentulism.
2. Classifications of edentulous jaws according to Snyder, Keller, Kurland. Types of mucosa by Supli. The concepts of mucosal mobility and compliance.
3. Preparation for prosthetics in complete edentulism (general and special).
4. Methods of fixation and stabilization of dentures on edentulous jaws (mechanical, physical, biomechanical, biophysical). Factors stabilizing dentures on the upper and lower jaws in cases of complete tooth loss.
5. Features of fabricating complete removable dentures in patients with oral mucosa diseases. Possible materials and methods for manufacturing complete removable dentures.

Classifications:

Snyder's classification (Upper jaw):

- Type I: Well-expressed tuberosities, alveolar process, high palatal vault, high-positioned and valve zone.
- Type II:Moderate alveolar ridge atrophy, moderately prominent maxillary tuberosities, medium-depth palatal vault and vestibule.
- Type III: Significant alveolar ridge atrophy, absence of tuberosities, flat palate, low-lying valve zone.

Keller's classification (Lower jaw):

- Type I: Well-defined alveolar process; the transition fold is located far from the alveolar crest.
- Type II: Uniform, severe alveolar ridge atrophy; mobile mucosa attached near the crest.
- Type III: Prominent alveolar process in the incisor region; markedly atrophied in molar area.
- Type IV: Atrophied alveolar process in the incisor region; prominent in molar area.

Kurland's classification of edentulous upper jaws:

- Type I High alveolar process, evenly covered with dense mucous membrane; well-developed tuberosities; deep palate; no torus or a mildly expressed torus ending at least 1 cm before point A; large mucous and glandular cushion above the soft palate aponeurosis.
- Type II: Moderate atrophy of alveolar process; mildly or not expressed maxillary tuberosities, shortened pterygoid fossa; moderate palate depth; prominent torus; average compliance of glandular cushion over the soft palate aponeurosis.
- Type III: Nearly absent alveolar process; significantly reduced maxillary bone size; weakly expressed maxillary tuberosities; shortened anterior-posterior dimension of the hard palate; flat palate; mildly expressed wide torus; narrow strip of passively mobile, compliant tissues along the line A.

Kurland's classification of edentulous lower jaws:

- Type I: Alveolar process protrudes above the attachment points of mandibular muscles from both inner and outer sides.
- Type II Both alveolar process and mandibular body are atrophied to the level of muscle attachment points.
- Type III: Atrophy of the mandibular body extends below the muscle attachment points.
- Type IV: Significant atrophy in the molar region.
- Type V: Significant atrophy in the anterior region.

Preparation of the oral cavity for prosthetics in cases of complete secondary edentulism is carried out in accordance with the orthopedic treatment plan and consists of psychotherapeutic, therapeutic, orthodontic, periodontological, and surgical measures. In recent years, significant attention has been paid to medical psychology and psychotherapeutic procedures during orthopedic treatment. It is very important for the doctor to establish contact with the patient and earn their trust, without which treatment is not advisable to begin. The patient should be informed about all features of complete removable dentures, the fundamental difference between artificial and natural teeth, the limits of possible restoration of chewing function, aesthetics, speech, and finally, about the role of the doctor and the patient itself in ensuring the success of orthopedic treatment.

Psychological preparation should be conducted considering the patient's temperament. The most favorable conditions for prosthetics occur when treating patients with balanced psyche (sanguine). People in this category are optimistic, calm, do not lose self-control even in difficult situations, are receptive to the doctor, and willingly follow all advice and instructions. Such patients easily overcome various discomforts and quickly get used to their dentures. The majority of patients are slow-tempered (phlegmatic), who require longer preparation. These patients should be constantly reminded that successful denture use largely depends on their effort, patience, and willpower aimed at overcoming sensations associated with having a prosthesis in the mouth. With well-made dentures, psychological preparation is a guarantee of successful adaptation.

The next category includes patients with easily excitable nervous systems (cholerics). These are people with a strong nervous system, impatient, irritable, and sometimes uncontrollable. They also need special attention. When prosthetizing such patients, the doctor must be very cautious, patient, and weigh every word. People with this type of psyche should be warned about the problems they will face when using dentures. The greatest psychological difficulties occur with patients having a weak nervous system (melancholics). These individuals are usually indifferent; they do not care about the absence of teeth or their appearance. Such patients turn to the doctor only at the insistence of friends or relatives.

Preparation of patients with complete secondary edentulism boils down to creating conditions that promote rational prosthetics. Surgical preparation involves excising hyperplastic mucosa within healthy tissues, followed by prosthetic rehabilitation with new removable dentures. Surgical preparation also includes excision of mobile alveolar mucosa, but if there is a small excess and little mobility, prosthetics can be performed without surgery. However, in cases of pronounced mobility of the "wobbly comb," it should be removed by wedge-shaped excision. Deepening of the oral vestibule is used in cases of significant alveolar ridge atrophy to increase the prosthetic area. Additionally, restraining bands and scars of the oral mucosa may be eliminated. Distinguish between natural mucosal formations (lingual and labial frenula, palatal-labial folds) and scar tissue, which can result from various injuries. These formations can hinder the creation of a seal zone and impair the fixation of the removable prosthesis. Radical treatment is performed surgically. Removal of the palatal torus, usually located in the middle of the palate and covered with thinned mucosa, is very rare. Bony formations called exostoses can be found on the alveolar process and mandibular body. They are located on the lingual side of the mandible, mostly in the

premolar region, and can have various shapes. Mild exostoses can sometimes be managed without surgery, but if they grow large, surgical removal is indicated.

Prosthodontic treatment of patients with chronic mucosal diseases is possible only during remission, and the construction of full removable plate dentures in such cases has specific features. It is necessary to minimize any traumatic factors, correctly restore the height of the lower face, avoid creating isolating chambers in the upper jaw, ensure that dentures are well-polished, and in some cases, create dentures with soft silicone liners. Regular monitoring of these patients is very important.

B. Boyanov suggested distinguishing between mechanical, biomechanical, physical, and biophysical methods of fixation of full removable dentures. Mechanical fixation includes attachments with springs; biomechanical methods include anatomical retention, fixation with intra-bony implants, and combinations thereof; physical methods involve magnets, suction chambers, and weightening of dentures; biophysical methods include subperiosteal magnets, adhesion phenomena, and the creation of edge-sealing valves.

Factors stabilizing full removable dentures include the fixation method chosen by the doctor and rational placement of teeth within the dentures. Accordingly, a number of basic requirements have been established for designing dental arches:

- Preservation of soft and hard tissues of the jaws;
- Stabilization of the denture by optimal tooth placement and normalization of their contact relationships;
- Positioning dental arches in a central occlusion without precontacts and ensuring slight, even pressure of the denture base on the supporting tissues with multiple contacts of equal force;
- As far as possible, evenly distributing the load over the alveolar ridge and alveolar parts of the jaws with balanced articulatory relationships. This means the dental arches should maintain even contacts throughout all functional movements of the mandible. If tilting moments occur on the working side, they should be compensated by contacts on the balancing side.

SITUATIONAL TASKS

1. Patient M., 79 years old, complains about inadequate fixation of the full removable prosthesis of the upper jaw. The prosthesis was made one month ago. During oral examination, the following clinical picture was noted: the alveolar process of the upper jaw is completely atrophied, the palate is flat, the torus is pronounced, and the posterior border of the base does not reach line "A." What is your suggested approach?

2. Patient B., 55 years old, during oral examination, the following was observed: a high alveolar process of the upper jaw, evenly covered with a dense mucous membrane, well-defined alveolar ridges of the upper jaw. The palate is deep. The torus is not pronounced. In the area of the upper lip frenulum, the edge of the base does not reach the transition fold. The patient complains about insufficient fixation of the upper jaw prosthesis. What is your approach?

3. During oral examination of patient K., it was noted that there is a complete absence of the alveolar process of the upper jaw, significant atrophy of the maxillary tubercles, a flat palate, and low attachment of the transition fold. Indicate the type of alveolar process atrophy according to Schröder.

4. Patient A., 72 years old, during objective examination of the oral cavity, was found to have: a uniform, severe atrophy of the alveolar process of the lower jaw; the mobile mucous membrane is attached almost at the level of the alveolar crest of the edentulous lower jaw; the opposing teeth—an FPD on teeth 17, 15, 14, 13, 23, 24, 26. According to the history, the patient has been using a removable prosthesis for 10 years and complains of insufficient fixation of the lower jaw prosthesis. What is your suggested approach?

5. Patient K., 73 years old, came to the clinic with complaints of pain in the area of the alveolar process of the lower jaw in the anterior region. Full removable plate prostheses for the upper and lower jaws were made a week ago. Noted is the presence of a "loose crest" of the mucous

membrane in the area of the lower anterior teeth. The mucous membrane in this area is hyperemic and edematous. What is your approach?

6. Patient X., 68 years old, had full removable prostheses on both jaws one month ago. Currently, the patient reports pain under the base in the area of tooth 25. Upon examination, the protruding root of tooth 25 is observed, with edematous and hyperemic mucosa. Identify the mistake made during the examination and treatment planning.

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

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6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 10

Subject: Orthopedic treatment of patients with complete anodontia. Fitting of an individual tray (according to the Herbst method). Obtaining and evaluating functional impressions.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To verify, analyze, and summarize students' knowledge of the methodology for fitting individual trays, methods of obtaining functional impressions, and the boundaries of complete removable plate prostheses for the maxilla and mandible.

Objectives of the lesson:

1. Improve skills in fitting individual trays in the oral cavity using functional trials and border formation to refine the prosthesis boundaries.
2. Reinforce knowledge and skills in various methods of obtaining functionally-adhesive impressions.

Class location: the clinical setting.

Practical skills mastered during the class:

Determining boundaries and fitting the individual tray for the maxilla and mandible using Herbst trial techniques. Obtaining functional impressions of the maxilla and mandible.

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 fully master the topic, students should review:

- From human anatomy: the anatomical structure of the maxilla and mandible in relation to age and after tooth loss; the anatomical and histological structure of the oral mucosa.
- From materials science: materials used in prosthetics and laboratory techniques for prosthesis fabrication.

Control questions from related disciplines:

1. Anatomical structure of the maxilla.
2. Anatomical structure of the mandible.
3. Morphological features of the soft tissues of the maxilla and mandible.
4. Masticatory muscles: characteristics and attachment points.

5. Functional and morphological changes occurring in the dentoalveolar system after complete tooth loss.

Control questions:

1. Individual trays: general characteristics, materials for fabrication.
2. Functional impressions: materials used for their obtained.
3. Fitting an individual tray to the maxilla with Herbst functional trials.
4. Fitting an individual tray to the mandible using Herbst functional trials.
5. Methodology for obtaining functional impressions, justification for selecting impression materials depending on the condition of the alveolar process mucosa.
6. Boundaries of the prosthesis bases for the maxilla and mandible.

A functional impression is an impression that reflects the condition of the tissues of the prosthetic bed during function, obtained with an individual tray using functional trials (with or without pressure).

Functional impressions can be:

- Compression impressions, obtained under continuous pressure that compresses the blood vessels of the mucous membrane of the hard palate and causes their emptying;
- Decompression (relief) impressions, obtained without applying pressure to the tissues of the prosthetic bed;
- Differential impressions, which provide selective loading on specific areas of the prosthetic bed depending on their functional endurance.

When obtaining impressions of an edentulous jaw, the following factors must be considered:

1. The overall contour or relief of the prosthetic bed;
2. The degree of compliance and mobility of the mucous membrane in different areas of the prosthetic bed;
3. The shape of the impression tray and the length of its edges;
4. The properties of the impression material, especially its flowability during different phases of setting;
5. The amount of pressure exerted on the tissues of the prosthetic bed by the impression material during impression taking;
6. The method of edging the prosthesis—active or passive;
7. The technique used for taking the impression.

When using modern materials, rigid individual trays are typically employed. It is possible to selectively increase or decrease the pressure during impression-taking, influence the distribution of pressure, and thus differently reproduce the mucous membrane of the prosthetic bed on the impression.

Compression impressions are taken under continuous pressure, which ensures the compression of blood vessels in the mucous membrane of the hard palate and their drainage. To obtain a compression impression, certain conditions must be met:

1. Use a rigid tray;
2. Only thermoplastic mass should be used for impression-taking;
3. The compression must be continuous, stopping only once the impression material has set.

Continuity can be maintained by manual force (voluntary pressure), but it is more correct to perform the compression impression under bite pressure (mastication force). For this purpose, custom plastic trays are made and fitted. Then, bite blocks are prepared from wax or acrylic to determine the central relationship of the jaws. A thin layer of impression material is applied to the

tray, inserted into the mouth, pressed against the jaw, and the edges are shaped. The patient is then asked to close the mouth, clench the jaws, and maintain this position until the impression material hardens. Without removing the upper tray, the same procedure is used to obtain the impression of the lower jaw.

Decompression (relief) impressions are taken without applying pressure to the tissues of the prosthetic bed. The mucous membrane is recorded in a relaxed state. According to decompression impression principles, the impression material should accurately reflect every detail of the oral mucosa without distortion so that the relief of the prosthetic base corresponds to the surface structure of the mucous membrane of the prosthetic bed. Such materials include low-viscosity silicone pastes and zinc-oxide eugenol pastes. Fixation of prostheses made from decompression impressions tends to be relatively weak. These impressions are used under specific indications: significant or complete alveolar ridge atrophy, and in cases of increased mucosal sensitivity.

Differential impressions provide selective loading on specific areas of the prosthetic bed depending on their functional endurance. Also, functional shaping of the impression edges is considered in all sections of the valve zone to maximize the surface area of the prosthetic bed. The procedure for obtaining a differential impression involves two stages:

- First, a pre-fitted tray is coated with impression material to take an impression of the entire prosthetic bed under pressure, maintaining force until the material fully polymerizes.
- Then, the impression is removed, evaluated, and sharp scalpel or burr cuts are made to remove impression material in areas planned for relief, with necessary holes made in those areas. Next, a more fluid material is prepared, applied to the designated relief zones, and an impression is taken under the same pressure.

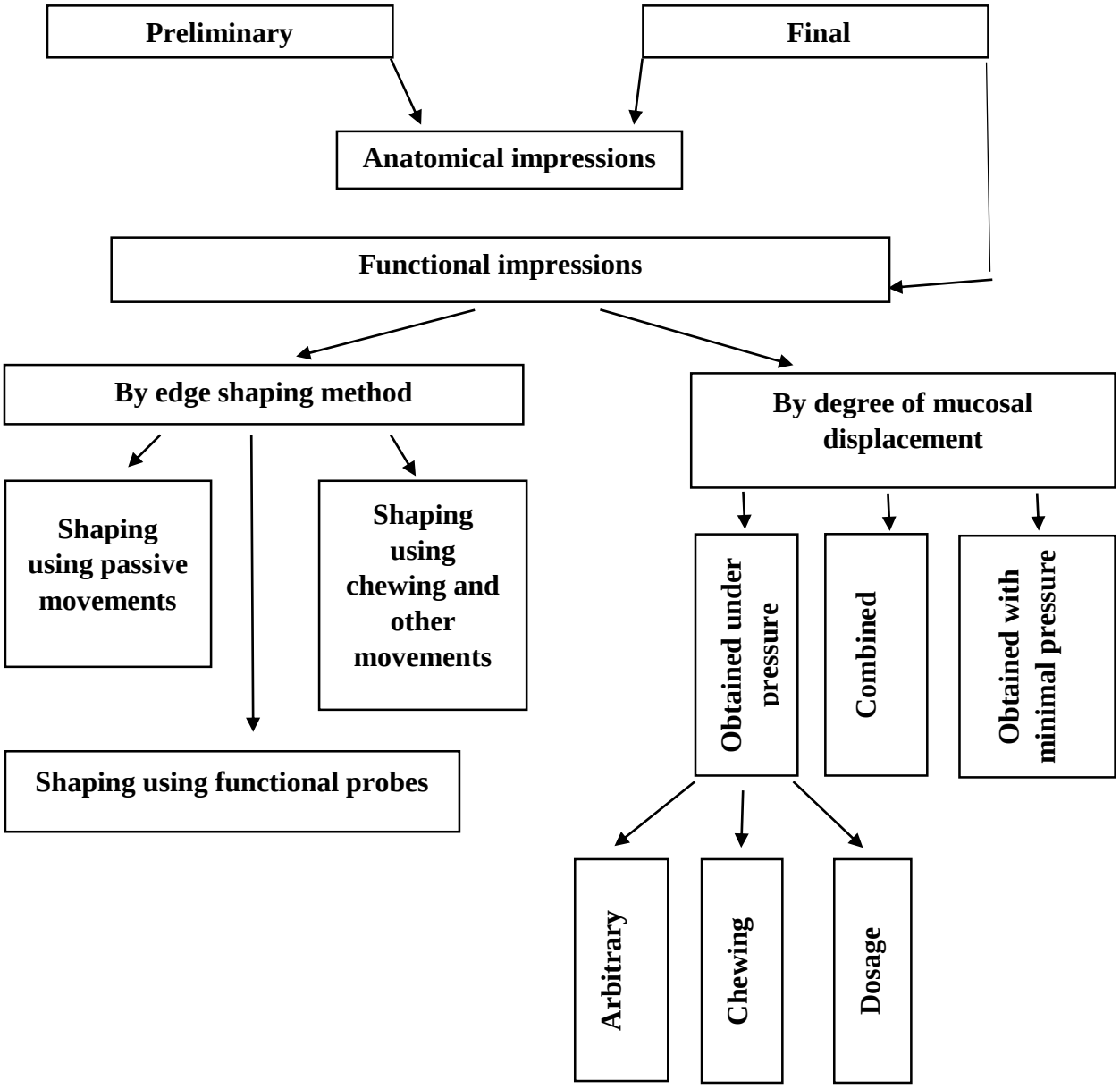
The technique for taking a selective impression with targeted pressure on the tissues of the prosthetic bed is applicable to all types of mucous membrane. In cases of highly mobile alveolar ridges, a combined impression method is recommended. Here, a rigid tray is fitted in the mouth according to standard techniques, then a wide opening is cut in the tray to fully expose the mobile alveolar ridge. A general impression is obtained using zinc-oxide eugenol or liquid silicone, and without removing it from the mouth, impression material is carefully layered onto the tray and the movable mucosa. After complete setting, the impression is removed from the mouth.

Borders of complete removable dentures:

- The borders of the upper denture on the vestibular side extend in the deepest part of the transition fold attachment, bypassing the labial frenum and movable buccal mucous tissues, completely covering the maxillary tuberosities, extending into the pterygomaxillary notches—but not covering the pterygomaxillary fold. The posterior border of the denture slightly overlaps the blind pits (the line between the hard and soft palate) by 1–2 mm, minimally reaching the "A" line located on the soft palate; in a gently sloped soft palate, the "A" line is overlapped by 1–2 mm.

- The borders of the lower denture on the vestibular side extend in the deepest part of the transition fold attachment, bypassing the labial frenum and movable buccal mucous tissues, fully covering the mucosal tubercles in the retromolar trigone areas. On the lingual side, in the posterior regions, borders extend 2–3 mm over the mandibular line of the mylohyoid ridge, following its rounded shape, or reach it if the ridge is sharply shaped. In the anterior region, the denture border follows the transition zone where the alveolar mucosa meets the mucosa of the floor of the oral cavity, bypassing the lingual frenum.

Classification of Impressions According to E.I. Gavrilov



Fitting Trays for Taking Impressions

Use of Functional Trials: To accurately capture the functional impression, custom trays must be carefully fitted inside the patient's mouth. Each functional trial allows precise recording of the relief in specific areas of the prosthetic bed and helps create a marginal seal with a closing valve. Methodology: The most commonly described method in educational literature is the Herbert technique of fitting custom trays using functional trials. According to this method, after inserting the custom tray into the oral cavity, the patient performs certain movements. If the tray shifts during these movements, its borders are shortened accordingly. Current Perspective: Recent studies emphasize the importance of functional trials; however, using them for the precise fitting of individual trays—especially the lower one—is considered impractical because it may reduce the borders of the tray. Trials should be performed with a reduced amplitude of movements, which is especially relevant for the mandibular (lower) jaw.

Trial	Correction Zone of the Custom Tray in Case of Fixation Issues
Fitting the tray on the maxilla (upper jaw)	
Swallowing	Dorsal border along line A
Wide mouth opening	Zone of the maxillary tuberosities and retromolar area on the Buccal surface
Cheek suction	Buccal surface on the right and left in the cheek mucosa area
Lip suction	Buccal surface in the region of the upper lip frenulum
Fitting the tray on the mandible (lower jaw)	
Swallowing	On the lingual side from the mucosal tubercle to the mental mandibular line
Wide mouth opening	If the tray drops from behind, shorten it from the buccal side from the mucosal tubercle to the projection of the first molar; if it drops in the frontal area, shorten it between the canines on the vestibular side
Tongue tip along the red border of the upper and lower lips	Along the mandibular-lingual line
Touching the cheek with the tongue tip with the mouth half-open	Lingual surface near the premolars
Sticking the tongue forward toward the tip of the nose	Lingual surface near the premolars
Extending the lips into a tube	Buccal surface between the canines

SITUATIONAL TASKS

1. Patient M., 73 years old. Diagnosis: Complete edentulism of the upper jaw, Type III according to Shredo. The mucosa of the alveolar process in the anterior section forms folds that unfold under pressure. What are the features of taking the impression in this case?

2. Patient O., 62 years old. Functional trials during fitting of the lower denture included: - Tongue touch to the cheek with the mouth half-open - Tongue retraction toward the nose tip - Swallowing - Pouting lips into a tube - Tongue along the red border of the upper and lower lips - Wide mouth opening Question: Identify errors in the sequence of performing these functional trials.

3. Patient A., 66 years old. After fitting an upper denture using functional trials, it was observed that pressing the handle of the tray upward and forward causes the tray to shift easily. Question: What is the likely cause of poor retention? Require: Describe the clinical approach.

4. Patient N., 70 years old. During functional impression-taking of the lower jaw, the front edge of the custom tray pushed away the highly mobile mucosa in the lateral area. What error was made during impression-taking?

5. Patient C., 70 years old. After fitting an upper denture using functional trials, it was noted that pulling the handle downward causes the tray to shift easily. What could be the reasons for this displacement?

6. Patient N., 60 years old. Complaints of partial fractures of the base of a complete removable prosthesis of the upper jaw. Findings: Moderate atrophy of the alveolar process; alveolar ridges are not well-defined; the palate has medium depth with a prominent torus. The previously made prosthesis shows signs of multiple repairs. Prostheses balance on the jaws. - What is the tactical approach? - What is the cause of the fracture? - What type of alveolar process atrophy is this?

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 11

Subject: Orthopedic treatment of patients with complete anodontia. Methods of determining the central relationship of the jaws and constructing dental arches in the case of complete absence of teeth.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To verify, analyze, and summarize students' knowledge about the construction of dental arches in the complete absence of teeth.

Objectives of the lesson:

Reinforce knowledge and skills:

- definition of the central relation of the jaws in cases of complete edentulism;
- identification of errors made during the determination of the central relation;
- main methods of setting artificial teeth in cases of complete edentulism.

Class location: the clinical setting.

Practical skills mastered during the class:

Correction, relining, and recommendations for the use and care of complete removable dentures.

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 fully grasp the topic, students need to review:

- from human anatomy: the anatomical structure of the upper and lower jaws, the structure and function of the temporomandibular joint (TMJ);
- from materials science: materials used and laboratory techniques for prosthesis fabrication;
- from radiological diagnostics: methods of radiological examination of the dentoalveolar system.

Control questions from related disciplines:

1. Biomechanics of the mandible.
2. Functional anatomy of the temporomandibular joint.
3. Articulation, occlusion, bite.

4. Relationship of alveolar processes in prognathism and retrognathism.

5. Features of the anatomical structure of edentulous maxilla and mandible.

Control questions:

1. Clinical and laboratory stages of constructing complete removable plate dentures.

2. Anthropometric landmarks for determining the central relation of the jaws. Methods for determining the height of the lower segment and their characteristics. Sequence of establishing the central relation of the jaws.

3. Methods of setting artificial teeth when fabricating complete removable dentures. Features of tooth placement in prognathic and retrognathic alveolar relations.

4. Technique and sequence of checking wax try-in of dentures.

5. Errors during the determination of the central relation of the jaws. Clinical signs and the dentist's tactics when increasing or decreasing the height of the lower facial segment during the "wax try-in" stage. Clinical signs and tactics related to fixing the mandible in anterior and lateral occlusions at the previous stage.

6. Re-prosthetics in complete edentulism using the duplication method.

Anatomical landmarks are established based on the traditional dental concept of optimal relationships between the lower jaw and skull bones. In literature, the central relation is interpreted as the relation of the jaws where the condylar surfaces articulate with the disc surface in the anterior-superior position against the posterior slope of the articular tubercle, i.e., at the base of the tubercle. The functional features of the central relation are based on the biomechanical concept of rigid relationships between the condylar head, the articulating disc, and the glenoid fossa, determined by the group of muscles—the elevators of the lower jaw. These articulating surface relationships are generally considered physiologically and biomechanically correct, as supported by tomographic studies of patients without pathological TMJ symptoms.

Clinical signs are based on border positions of the lower jaw. The central relation and its main feature – a posterior contact position – are determined by manipulating the mandible in a purely rotational movement around the horizontal transverse hinge axis.

The hinge axis is an imaginary line connecting the centers of rotation of the joints.

Central relation is the position in which the condyles of the lower jaw are at the highest unstrained position relative to the glenoid fossae, with the mandible in a mid-sagittal position; it can freely rotate around the terminal hinge axis passing through the condyles.

To determine the central relation of the jaws means to establish the position of the lower jaw relative to the upper in three mutually perpendicular planes: vertical, sagittal, and transverse.

Depending on the position of the mandible relative to the maxilla, the following are distinguished:

- Relative physiological rest position;
- Central occlusion, or the central relation of the jaws;
- Lateral (right, left) occlusion;
- Anterior occlusion.

Relative physiological rest position is one of the articulatory positions of the mandible at minimal activity of the masticatory muscles and relaxed mimic muscles. The tone of the muscles elevating and lowering the mandible is equal. The basis of this position is the fact that occlusal height is 2–4 mm less than that at physiological rest. Physiological rest is a position where the mandible is free, with a 2–3 mm gap between the teeth, and the mimetic and masticatory muscles are fully relaxed.

Understanding the anatomical position of the jaws requires correctly identifying points and lines within a specific coordinate system.

Lines passing through the infraorbital point (orbitale – the lowest point on the inferior orbital margin) and porion (the highest point of the external auditory meatus) form the Frankfurt horizontal plane. Lines passing through the subnasale (the deepest point of the nasal base

transitioning into the upper lip) and the middle of the porcus (ear tragus) form the Camper's plane (Camper's line – nasioaural line). The occlusal (prosthetic, chewing) plane can roughly be formed by a line connecting the incisal edge of the central lower incisor, the apex of the disto-buccal cusp of the second lower molar, and the middle of the retromolar pad. In rare cases, its shape is flat. Most dental arches have a curved occlusal plane, where the level of the teeth increases from premolars to third molars. This curve is known as Spee's curve. It varies for each dental arch and has no clearly defined center of curvature. The functional and anthropological significance of this curve remains unclear.

The medial-lateral tilt and curvature of the occlusal plane are called Wilson's curve. This curvature results from the inclination of the posterior lower teeth towards the tongue and posterior upper teeth towards the cheeks.

Clinical stages of determining the central relation include evaluating the quality of wax bases, establishing the prosthetic plane, determining the height of the lower facial segment, fixing the central relation of the jaws, and marking anatomical landmarks.

Methods for determining the height of the lower face segment

Static Methods

1. Determining the occlusal height before the removal of the last pair of opposing teeth, during which the clinician may perform:

- Measurements on the patient's face;

- Measurements on gypsum models of the jaws in an articulator;

- Measurements on profile photographs of the face;

- Construction of a facial mask.

2. Measurements of old dental prostheses.

3. Anatomical method.

4. Anthropometric method.

5. Telerentgenography (Cephalometric radiography).

6. Relationship of edentulous alveolar ridges (Occlusion blocs are fitted to create:

- Parallelism of the alveolar ridges of the upper and lower jaws, with a divergence in the distal parts up to 50 mm (this method can only be used in cases of uniform minor alveolar atrophy);

- The distance from the incisal papilla of the maxilla to the incisal edge of the lower central incisors – 4 mm, with the upper incisal edge positioned 6 mm below the papilla (this method can only be used when the lower incisors are preserved).

Dynamic Methods

1. Anatomo-physiological (determining the height of physiological rest).

2. Phonetic method.

3. Determination of swallowing threshold.

4. Study of the tonus of masticatory muscles and force of masticatory pressure.

5. Use of tactile sensations of the patient.

6. Functional-physiological or instrumental methods.

DETERMINATION OF THE LOWER FACE HEIGHT AND FIXATION OF THE CENTRAL JAW RATIO IN PATIENTS WITH COMPLETE ABSENCE OF TEETH

Order of activities	Means of operation	Criteria for correct action
1. Seat the patient in the dental chair.	Dental chair	The patient's back rests firmly against the backrest of the chair, head slightly tilted backwards.
2. To evaluate the quality of the manufactured wax bases with occlusal rollers on the models of the upper and lower jaws.	Plaster models of upper and lower jaws, wax bases with occlusal rollers.	1. The boundary of the wax bases corresponds to the boundaries delineated on the plaster models. 2. Tight adhesion of the wax base to the models, no balancing. 3. The dimensions of the rolls: in the frontal section, height 1.8 - 2.0 cm, width 0.4 - 0.6 cm, in the lateral section, height 0.8 - 1.2 cm, width 0.8 - 1.0 cm.
3. Remove the wax bases with occlusal rollers from the model and disinfect with alcohol.	A cotton swab moistened with alcohol.	All surfaces of the wax base with the bite rolls must be treated.
4. Dip the wax bases with occlusal rollers into a tray with cold water for 2-3 min.	A tray of water.	
5. Insert wax rollers into the patient's mouth, apply and check the position of the upper jaw wax base on the denture bed.	A set of dental instruments, a wax base of the upper jaw.	Tight fit of the base to the denture bed, conformity to the boundaries of the future denture, no balancing.
6. Form the vestibular surface of the occlusal roll of the maxilla.	Set of dental instruments, Naisch apparatus, wax base of the upper jaw.	Harmonious position of the upper lip: the upper lip is not sunken or protruding. Nasolabial angle ≈ 900, red lip border should be visible.
7. Determine the height of the occlusal shaft of the maxilla in the frontal region.	Set of dental instruments, Naisch apparatus, wax base of the upper jaw.	The frontal part of the wax base protrudes from under the upper lip by 1-2 mm or is at its level in case of medium lip type (8-14 mm). It should be remembered that the length of the upper lip can be different, depending on this, the edge of the upper roll can protrude from under the lip at 2 mm in the short type of lip (5-7mm), and be at its level or above the edge of the upper lip at 2 mm in the long type of lip (15-2mm). Add or remove excess wax in the frontal height area.

8. Form a prosthetic plane on the upper occlusal ridge in the frontal area.	Ruler, Larin's apparatus, set of dental instruments, Naisch's apparatus, wax base of the upper jaw.	Achieve parallelism with the pupillary line. A ruler is placed on the occlusal surface of the roll in the frontal area. It should be parallel to the ruler placed on the pupillary line.
9. Form the prosthetic plane in the lateral area.	Ruler, Larin's apparatus, set of dental instruments, Naisch's apparatus, wax base of the upper jaw.	The ruler placed on the horizontal surface of the roll in the lateral section should be parallel to the ruler aligned with the Kamper horizon (wing of the nose, middle of the ear goiter). Achieve parallelism by cutting or adding wax on the occlusal rollers.
10. Determine the height of the lower face using the anatomo-physiological method.	Ruler, Larin apparatus, set of dental instruments.	After talking to the patient, when the lower jaw is set in a position of relative physiological rest, it is necessary to measure the distance between two points marked at the base of the nasal septum and on the chin. At the same time lips should be closed for the whole length (without tension). The height of the lower face (height of occlusion) is determined by subtracting from the height of physiological rest 2-4 mm. The expression of various anatomical formations on the face is also observed.
11. Stock the occlusal roll of the mandible according to the defined mandibular height.	Ruler, set of dental instruments, Naisch apparatus, wax base of the mandible.	The lower occlusal ridge must lie tightly against the upper occlusal ridge throughout. The occlusal height should be 2-4 mm lower than the physiological resting height.
12. Determine the position of the mandible in relation to the skull in the sagittal and horizontal planes.	Wax base with occlusal rollers of the upper and lower jaws	Clamping is the same each time, there is no forward or backward movement of the mandible or left-right displacement. The weight-tibular surfaces of the occlusal rollers are in the same plane when closing.
13. Fix the central relationship of the jaws.	Spatula, wax base with occlusal rollers of upper and lower jaws	On the occlusal surface of the maxillary shaft, cross-shaped incisions up to 1.5-2 mm wide are made. On the occlusal surface of the mandibular shaft, make notches opposite the cross-shaped incisions, in which small pieces of softened wax are placed. The wax templates are then inserted into the oral cavity and the patient is asked to close the mouth while monitoring the position of the bases and mandible.

14. Check that the jaw centricity is correctly determined and fixed	Wax base with upper and lower jaw occlusal rollers, water tray.	After removing the wax rolls from the oral cavity, they are placed on the plaster models, making sure that the bases adhere to the denture bed and do not balance on the models. The bases are separated, cooled in water and reinserted into the oral cavity. The doctor checks the correctness of the patient's jaw closure, excludes possible displacement of the mandible in the horizontal and sagittal planes and displacement and deformation of the wax bases. Checks the correctness of determining the height of the lower face.
15. Apply anatomical landmarks to the occlusal rollers for the placement of artificial teeth.	Spatula.	The first line, the midline, is drawn in such a way that it divides the upper lip filtrum and Cupid's bow into equal parts (the frenulum of the upper lip should not be used as it is often shifted to the side). The intersection of the midline with the prosthetic plane is the location of the mesial corners of the central incisors. The perpendicular drawn from the external wing of the nose divides the canine in half, i.e. there are 2.5 teeth on each side between the midline and the canine line The horizontal line drawn along the border of the red border of the upper lip when the patient smiles is an approximate reference point for the height of the upper frontal teeth.

METHODS OF DENTURE SETUP

- According to anatomical landmarks;
- Anatomical, "by glass" (Vasilev method);
- According to the calotte;
- According to spherical occlusal planes;
- According to individual occlusal planes.

Anatomical method

The placement of artificial teeth begins with the maxillary central incisors. According to various authors' recommendations, artificial central incisors should be positioned 7 mm anterior to the incisal papilla. Additionally, the labial surfaces of the central incisors should harmoniously fit into the contours of the vertical anterior arch and be part of it. The incisal edge of the central incisors should lie in the vertical plane at the incisal point i, which, in an orthognathic relationship, is located 2 mm below half the depth of the oral vestibule. The position of the incisal edge is determined by the formula i = (FF/2 + 2) mm.

The main reference points for setting the maxillary canines are the anterior transverse palatal folds. The canines are positioned with their axes inclined mesially at a distance of 2 mm from the anterior palatal folds. The inclination of the canine toward the vestibular direction should be minimal or its placement should be vertical.

The incisal papilla can serve as a guide for placing the canines. The line connecting the tips of the canine cusps passes through the middle of the incisal papilla in 68% of patients.

The lateral incisors are positioned between the canines and central incisors. When placing them, the incisal edge is set 0.5 mm above the occlusal plane, with a slightly greater mesial inclination of the long axis than that of the central incisors.

After placing the upper anterior teeth, the lower canines are installed. They are positioned in a neutral bite relation to the upper teeth with a mesial inclination.

The buccal-lingual position of the mandibular posterior teeth is determined using the Pound line, which runs from the mesial edge of the canine to the lingual border of the retromolar triangle along the lingual cusps of the posterior teeth. The central fossae of the posterior teeth should align with the alveolar line.

The Spee curvature is formed relative to a line from the tip of the lower canine cusp (the lip contact line) to the middle of the retromolar triangle. The curvature occurs because:

- the 4th tooth is positioned 0.5 mm lower than the 3rd;
- the 5th is 0.5 mm lower than the 4th;
- the 6th is 0.5 mm lower than the 5th;
- the 7th has such a steep inclination that it contacts the specified curvature with the distal buccal cusp.

After placing the mandibular posterior teeth, the maxillary posterior teeth are set. Their reference is the mandible.

The vestibular surfaces of the canines and molars contact a straight line, behind which the premolars are located. Finally, the lower incisors are set, preferably creating a sagittal gap proportionate to the vertical overlap of the incisors.

"Glass" Method for setting teeth,

M.E. Vasilev Method**

This method involves replacing the occlusal prosthetic plane with a glass surface, supported on the mandibular model.

Indications for this method include:

- Class I jaw relationship according to Engel;
- Mild atrophy of alveolar ridges;
- Favorable intermaxillary relationships;
- Presence of a stable, easily reproducible orthognathic relationship;
- Predominance of vertical mandibular movements.

Sequence of teeth arrangement:

1. The upper central incisors are positioned symmetrically along the midline so that their incisal edges touch the glass.
2. The lateral incisors are slightly moved away from the midline at the cervical part and do not touch the glass by 0.5 mm.
3. The canines contact the glass via their cusps and form rotational points of the dental arch, with the anterior part of the cusp aligned with the anterior teeth arch and the posterior part directing the arch toward the premolars.
4. The first premolars are placed so that only their buccal cusps touch the glass, while the palatal cusps are 1 mm away.
5. The second premolars touch the glass with both cusps.
6. The first molars contact the glass only with their mesial palatal cusp, with the distal palatal cusp 1 mm away, and the distal buccal cusp 1.5 mm away.

7. The second molars do not contact the glass with their cusps and continue the line of the first molar.

After completing the upper teeth setup, the lower teeth are arranged, starting with the second premolars, as they are easily positioned between the first and second upper premolars. Subsequently, molars on each side are placed, and finally, the anterior teeth are set.

During this process, multiple contacts of the occlusal surfaces are achieved in the lateral regions of the dental arch.

Placement of artificial teeth based on spherical occlusal planes

The method is based on the theory of spherical articulation. G. Monson (1920), which is grounded in the concepts of S. Wilson and E. Spee regarding the presence of transverse and sagittal occlusal curves. According to G. Monson, the buccal cusps of all teeth lie on the surface of a sphere, with long vertical axes directed towards and converging at the center of this sphere. The sphere's center is located in the cranial region near the crista gali. The radius of the sphere is 10.4 cm. G. Monson believed that orienting the teeth placement according to this spherical surface allows for optimal stabilization of complete removable dentures during all mandibular movements.

Designing dental arches based on individual occlusal spherical surfaces

Proposed by M. A. Napadov and A. L. Sapozhnikov (1972). The essence of the method involves using rigid occlusal templates with wax-abrasive rollers.

The roller for the maxilla has a convex occlusal spherical surface of a specified radius, while the mandibular roller has a concave surface. The height of the lower third of the face with the rollers should be 6–8 mm higher than the resting height. By simulating functional movements, the patient gradually wears down the occlusal rollers to reach the desired height of the lower facial third.

When constructing the dental arches using this method, there is no need for an articulator. The upper teeth are positioned based on the formed surface of the lower roller, and the lower teeth are aligned according to the upper roller.

Errors in fixing the centric relationship of the jaws caused by displacement of the lower jaw relative to the upper jaw

Error in Fixing Centric Relationship	Clinical Manifestation at Design Check Stage
1. Forward displacement of the lower jaw (fixation of lower jaw protrusion)	• Prognathic relationship of artificial teeth • Sagittal gap; • Cusp interdigitation of lateral teeth; • Increased height of the lower third of the face to the height of the cusps.
2. Lateral displacement of the lower jaw (fixation of right or left lateral occlusion)	• Lack of contact between lateral teeth on the side of displacement; • Displacement of the center of the lower dental arch toward the opposite side of jaw displacement • Cusp contact of antagonist teeth on the opposite side; • Increased height of the lower third of the face to the height of the cusps.

ALGORITHM FOR ELIMINATING ERRORS RELATED TO INCORRECT DETERMINATION OF VERTICAL DIMENSION OF OCCLUSION (VDO)

Assess the correctness of tooth placement on the upper denture (orientation of the occlusal plane, protrusion of central incisors from under the upper lip).

The placement of teeth on the upper denture has been done correctly.

↓

The VDO has changed due to incorrect placement of teeth on the lower denture.

↓

Create a new lower wax base with occlusal rims

↓

Redefine the VDO and fix the centric relationship of the jaws

↓

Reposition the teeth of the lower denture.

The placement of teeth on the upper denture has been done incorrectly.

↓

Create a new lower and upper wax base with occlusal rims

↓

Redefine the VDO and fix the centric relationship of the jaws

↓

Reposition the teeth of the lower and upper dentures.

SITUATIONAL TASKS

1. During the check of the prosthesis construction on models, the teeth occlude along the entire length. When overlaying the wax reproductions of the prostheses onto the prosthetic bed in the centric occlusion position, disocclusion is observed in the area of the molars and premolars on the right side by 1–2 mm (the disocclusion was achieved by inserting a prosthetic spatula). Explain the cause of the error and how to correct it.

2. Patient N., 67 years old, with complete removable dentures, complained of "clicking" of the artificial teeth and some fatigue of the muscles elevating the upper jaw. What could be the possible causes of these complaints? What is the clinician’s approach?

3. Patient K., 72 years old, visited an orthodontic clinic with complaints of newly appeared cracks in the corners of the mouth. The dentures were made 3–4 months ago. The patient uses the dentures constantly. On examination, drooping of the mouth corners, pronounced nasolabial folds, and maceration of the epithelium in the corners of the mouth are observed. What could be the possible cause of the cracks?

4. During the stage of determining the central relation of the jaws in a patient with complete edentulism, Dr. A. performed the following manipulations with the wax base with occlusal rollers on the upper jaw: determined the height of the occlusal roller in the anterior region; shaped the prosthetic plane in the anterior region; shaped the prosthetic plane in the lateral region. Did the doctor perform all the manipulations correctly with the wax base with occlusal rollers on the upper jaw?

5. During the stage of determining the central relation of the jaws in a patient with complete edentulism, Dr. M. drew a face center line on the rollers, guided by the position of the upper lip frenulum. Was an error made? What could be the consequences of this mistake?

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 12

Subject: Etiology, pathogenesis, clinical manifestations, diagnostics and orthopedic treatment of patients with periodontal diseases.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To analyze and deepen students' knowledge of the etiology, pathogenesis, and clinical features of periodontal tissue diseases. To reinforce knowledge and skills in: classifications of periodontal diseases, diagnostic methods, differential diagnosis of periodontal diseases, and deontological rules for patient management in this category.

Objectives of the lesson:

1. Study classifications of periodontal diseases.
2. Study the etiology, pathogenesis, and clinical manifestation of periodontal diseases.
3. Learn about radiological features of periodontal tissue diseases.
4. Develop skills in differential diagnosis of periodontal diseases.
5. Review deontological rules for treating patients from this category.

Class location: the clinical setting.

Practical skills mastered during the class:

Diagnosis formulation and treatment planning for a patient.

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 fully master the topic, students should review:

- From human morphology: structure and functions of periodontal tissues.
- From therapeutic dentistry: methods of treating periodontal diseases.
- From radiological diagnostics: methods of radiographic examination of the dento-maxillary system.

Control questions from related disciplines:

1. Structure of periodontal tissue.
2. Functional anatomy of the temporomandibular joint.
3. Articulation, occlusion, bite.
4. Reserve forces. Resilience of periodontal tissues.

Control questions:

1. Etiology and pathogenesis of periodontal diseases.
2. Pathological changes in periodontal tissues in chronic simple and complex periodontitis.
3. Classification of periodontal diseases by WHO and the International Classification.
4. Clinical, radiological, and laboratory diagnostic methods for periodontal diseases.
5. Clinical manifestations and differential diagnosis of periodontal diseases.
6. Deontological rules when treating patients with periodontal diseases.

Main Etiological Factors in Periodontal Diseases:

1) Microbial products from dental plaque.

2) Oral hygiene regime influencing the pathogenic potential of microorganisms and their metabolites.

3) Systemic factors regulating the metabolism of oral tissues, affecting the response to pathogenic influences.

Undoubtedly, the most potent etiologic agent provoking an immune response is the microbial factor, which causes various clinical manifestations of periodontal diseases. In their pathogenesis, significant roles are played by the composition and species specificity of microorganisms in plaque, its volume, and the duration of their presence in the gingival areas and periodontal tissues.

Periodontal inflammation begins with the marginal gingiva and spreads into deeper tissues surrounding the tooth, indicating a transition from gingivitis to periodontitis. While all periodontitis cases stem from gingivitis, not all gingivitis progresses to periodontitis. In some cases (especially in adolescents), they never lead to periodontitis, while in others, progression can be very rapid. According to some periodontists, the mechanisms responsible for inflammation at the supporting apparatus level and for the transition from gingivitis to periodontitis remain unclear. However, many fundamental studies have shown that this transition is related to changes in the composition of bacterial plaque and cellular infiltrate content. As periodontitis progresses, the number of motile microorganisms and spirochetes increases, while the number of cocci and rod-shaped bacteria decreases. It has also been established that the cellular infiltrate contains increased numbers of B-lymphocytes and plasma cells. The inflammatory process spreads from the gingiva into the structures of the periodontal supporting apparatus through loose tissues and blood vessels, involving alveolar bone. Its spread is particularly dangerous when accompanied by bone destruction and disease progression.

Despite the various causes of periodontal diseases, at all stages of disease development, functional overload of the supporting apparatus, traumatic occlusion, and tooth mobility are present.

CLASSIFICATION OF PERIODONTAL DISEASES

XVI SESSION OF THE ALL-UNION SCIENTIFIC SOCIETY OF DENTISTS / October 10–12, 1983, Yerevan

1. Gingivitis – inflammation of the gums caused by adverse effects of local and systemic factors, occurring without disruption of the periodontal ligament’s integrity.
   - Forms: catarrhal, ulcerative, hypertrophic.
   - Severity: mild, moderate, severe.
   - Course: acute, chronic, exacerbated.
   - Prevalence: localized, generalized.
2. Periodontitis – inflammation of periodontal tissues characterized by progressive destruction of the periodontium and alveolar bone.

- Severity: mild, moderate, severe.
- Course: acute, chronic, exacerbation, abscess, remission.
- Prevalence: localized, generalized.

3. Periodontosis — dystrophic lesion of the periodontium.
- Severity: mild, moderate, severe.
- Course: chronic, remission.
- Prevalence: generalized.

4. Idiopathic Diseases with Progressive Loss of Periodontal Tissues.

5. Periodontoma — tumors and tumor-like diseases.

INTERNATIONAL CLASSIFICATION OF GUM AND PERIODONTAL DISEASES

K05 — Gingivitis and Periodontal Diseases

Includes: diseases of the edentulous alveolar ridge

K05.0 — Acute gingivitis

Excluding: acute pericoronitis (K05.22), acute necrotizing ulcerative gingivitis (Vincent's gingivitis) (A69.10), herpetic gingivostomatitis (B00.2X)

- K05.00 — Acute streptococcal gingivostomatitis
- K05.08 — Other acute specific gingivitis
- K05.09 — Acute nonspecific gingivitis

K05.1 — Chronic gingivitis

- K05.10 — Simple marginal
- K05.11 — Hypertrophic
- K05.12 — Ulcerative

Excluding: ulcerative-necrotizing gingivitis (A69.10)

- K05.13 — Desquamative
- K05.18 — Other chronic specific gingivitis
- K05.19 — Chronic nonspecific gingivitis

K05.2 — Acute periodontitis

- K05.20 — Periodontal abscess (periodontal abscess) of gingival origin without fistula, excluding: acute apical periodontitis of pulp origin (K04.4), acute periapical abscess of pulp origin (K04.6, K04.7)
- K05.21 — Periodontal abscess (periodontal abscess) of gingival origin with fistula, excluding same as above
- K05.22 — Acute pericoronitis
- K05.28 — Other acute specific periodontitis
- K05.29 — Acute nonspecific periodontitis

K05.3 — Chronic periodontitis

- K05.30 — Simple
- K05.31 — Complex
- K05.32 — Chronic pericoronitis
- K05.33 — Follicular thickening
- K05.38 — Other chronic specific periodontitis
- K05.39 — Chronic nonspecific periodontitis

K05.4 — Periodontosis

- Juvenile periodontitis

K05.5 — Other periodontal diseases

K06 — Other diseases of the gums and edentulous alveolar ridge

Excluding: atrophy of edentulous alveolar ridge (K08.2), gingivitis (K05.0, K05.1)

K06.0 — Gum recession

Including: post-infectious, postoperative

- K06.00 — Localized

- K06.01 — Generalized
- K06.09 — Nonspecific gum recession

K06.1 — Gingival hypertrophy

Including: bulpiness
- K06.10 — Gingival fibromatosis
- K06.18 — Other specific gingival hypertrophy
- K06.19 — Nonspecific gingival hypertrophy

K06.2 — Changes in the gums and edentulous alveolar ridge associated with trauma

Including:
- K06.20 — Due to traumatic occlusion
- K06.21 — Due to tooth cleaning
- K06.22 — Frictional (functional) keratosis
- K06.23 — Dental hyperplasia
- K06.28 — Other specific trauma-associated gingival and alveolar ridge lesions
- K06.29 — Nonspecific trauma-associated gingival and alveolar ridge lesions

K06.8 — Other specific lesions of the gums and edentulous alveolar ridge

Including:
- K06.80 — Gingival cyst in adults

Excluding: gingival cyst of the newborn (K09.82)
- K06.81 — Peripheral giant cell granuloma (giant cell epulis)
- K06.82 — Fibrous epulis
- K06.83 — Pyogenic granuloma

Excluding: pyogenic granuloma of other areas of gums and edentulous ridge
- K06.84 — Mobile ridge
- K06.88 — Other unspecified specific lesions

SITUATIONAL TASKS

1. Patient A., 23 years old, presented to the clinic with complaints of bleeding and swelling of the gums, and pain when eating. Previously, no treatment was sought for these issues. External examination revealed no notable features. Jaw movements in the temporomandibular joint (TMJ) are full and painless. Dental formula:

4	4	3	3	0	0	0	0	0	0	0	3	3	3	0	4
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
4	0	0	3	3	0	0	0	0	0	0	0	0	3	3	0

Upon oral examination, hyperemia and swelling of the mucous membrane are noted in the anterior lower jaw region. Crowding of teeth in the anterior region of the lower jaw is observed. The odontoparodontogram indicates no resorption of the alveolar bone in the upper and lower jaws. Determine the diagnosis.

2. Patient K., 27 years old, visited the clinic complaining of bleeding gums during tooth brushing and pain when eating. External examination was unremarkable. Full, painless jaw movements. Dental formula:

4	0	4	4	0	3	3	0	0	3	0	3	3	4	0	4
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
4	3	4	4	0	0	0	0	0	0	0	3	3	4	4	3

Oral examination shows hyperemia and swelling of the mucous membrane around the teeth of the upper and lower jaws. No pathological mobility of teeth is observed. The odontoparodontogram indicates no signs of alveolar bone resorption. Determine the diagnosis.

3. Patient L.,38 years old, presented with complaints of periodic swelling of the gums and bleeding, as well as tooth mobility in the anterior lower jaw. External examination shows no notable features. Jaw movements are full and painless. Dental formula:

0	0	4	0	0	0	3	3		3	3	0	0	0	0	4	3
18	17	16	15	14	13	12	11		21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41		31	32	33	34	35	36	37	38
4	0	4	0	3	3	0	0		0	0	0	3	0	3	3	4

During oral examination, hyperemia and swelling of the mucous membrane around teeth 31, 32, 33, 41, 42, 43 are noted. There are periodontal pockets up to 3 mm deep, and pathological mobility of 1–2 degrees. Radiologically, resorption of the alveolar process in areas of teeth 31, 32, 33, 41, 42, 43 ranges from 1/4 to 1/2. Determine the diagnosis.

4. Patient V., 49 years old, complained of tooth loss, impaired chewing function, and mobility of the remaining teeth. She had previously received treatment by a periodontist. External examination revealed a decrease in the height of the lower third of the face. Full painless jaw movements.

Dental formula:

4	4	4	4	3	3	0	0		0	0	0	4	4	3	4	4
:18	17	16	15	14	13	12	11		21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41		31	32	33	34	35	36	37	38
4	4	4	4	4	0	3	0		0	0	4	3	4	4	4	4

Oral examination shows hyperemia and swelling of the mucous membrane around the remaining teeth, with periodontal pockets from 3 to 5 mm, and pathological mobility of 2–3 degrees. The upper and lower teeth are arranged in a fan-shaped pattern, with diastema and trem in the anterior region. Subgingival and supragingival calculus is present. The odontoparodontogram indicates uneven atrophy of the alveolar process from 1/2 to 3/4. Determine the diagnosis.

5. Patient R., 45 years old, presented with complaints of partial tooth loss on the upper jaw, impaired chewing function, and no prior orthodontic or prosthetic treatment. External examination was unremarkable. Full painless jaw movements. Dental formula:

4	0	4	4	3	0	0	0		0	0	0	3	4	3	4	4
:18	17	16	15	14	13	12	11		21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41		31	32	33	34	35	36	37	38
4	0	3	3	3	0	3	0		0	0	0	4	3	4	0	4

Oral examination reveals atrophic, pale mucous membrane in the area of remaining teeth, exposure of tooth roots, and degree 1 pathological wear. Periodontal pockets measure from 3 to 5 mm, with pathological mobility of 2–3 degrees. The odontoparodontogram shows uniform atrophy of the alveolar process up to 1/2. Determine the diagnosis.

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

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6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 13

Subject: Biological bases of splinting. The role of occlusal trauma in the development of periodontal diseases.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To analyze and deepen students' knowledge of methods for determining reserve forces and assessing the functional state of the periodontium, techniques for filling out and analyzing the odontoparodontogram in periodontal diseases, causes of tooth overload, and methods for identifying overloaded teeth. To reinforce knowledge and skills in clinical methods for evaluating the condition of the periodontium.

Objectives of the lesson:

1. Reinforce knowledge of the etiology, pathogenesis, clinical presentation, and diagnosis of periodontal diseases.
2. Study and learn to analyze the odontoparodontogram in periodontal diseases.
3. Clarify the causes of tooth overload, as well as clinical methods for assessing the state of the periodontium.
4. Master techniques for selective occlusal adjustment of teeth.

Class location: the clinical setting.

Practical skills mastered during the class:

Interpretation of the odontoparodontogram.

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 fully master the topic, students should review:

- From human morphology: structure and functions of periodontal tissues.
- From therapeutic dentistry: methods for treating periodontal diseases.
- From radiological diagnostics: methods of radiological examination of the maxillofacial system.

Control questions from related disciplines:

1. Structure of the periodontium.
2. Functional anatomy of the temporomandibular joint.

3. Articulation, occlusion, bite.

4. Reserve forces. Endurance of the periodontium.

Control questions:

1. What are the endurance and reserve forces of the periodontium? Their significance in orthopedic treatment of periodontal tissue diseases.

2. Clinical and radiological signs of periodontal tissue lesions, their interrelation.

3. The odontoparodontogram: principles of its construction and structure. Analysis of the functional state of the periodontium based on the odontoparodontogram.

4. Causes of overload of individual teeth or groups of teeth. Clinical picture and methods for identifying overloaded teeth with periodontal overload.

5. Tooth grinding (occlusal adjustment) as the initial stage of periodontal treatment. Methods of selective occlusal adjustment, complications.

	(11,5)					(7,5)						(11,5)					
Более ¼	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	С
¼-0,75%	0,5	0,75	0,75	0,45	0,45	0,4	0,25	0,3	0,3	0,25	0,4	0,45	0,45	0,75	0,75	0,5	у
½ -,05%	1,0	1,5	1,5	0,9	0,9	0,75	0,5	0,6	0,6	0,5	0,75	0,9	0,9	1,5	1,5	1,0	М
¼-0,25%	1,5	2,25	2,25	1,3	1,3	1,1	0,75	0,9	0,9	0,75	1,1	1,3	1,3	2,25	2,25	1,5	М
И	2,0	3,0	3,0	1,75	1,75	1,5	1,0	1,25	1,25	1,0	1,5	1,75	1,75	3,0	3,0	2,0	А
																	30,5
	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
И	2,0	3,0	3,0	1,75	1,75	1,5	1,0	1,0	1,0	1,0	1,5	1,75	1,75	3,0	3,0	2,0	С
¼-0,25%	1,5	2,25	2,25	1,3	1,3	1,1	0,75	0,75	0,75	0,75	1,1	1,3	1,3	2,25	2,25	1,5	у
½ -,05%	1,0	1,5	1,5	0,9	0,9	0,75	0,5	0,5	0,5	0,5	0,75	0,9	0,9	1,5	1,5	1,0	М
¼-0,75%	0,5	0,75	0,75	0,45	0,45	0,4	0,25	0,25	0,25	0,25	0,4	0,45	0,45	0,75	0,75	0,5	М
Более ¼	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	А
		(11,5)					(7,0)						(11,5)				30,0

Fig. 13.1. Periodontogram

To determine the functional state of the stomatognathic system, V.Yu. Kuryandskiy proposed a scheme for the graphical representation of the functional state of the periodontium—a periodontogram. It is used in diagnosis and treatment planning, taking into account the elimination of functional overload of individual teeth through redistribution among groups of teeth and the creation of supporting blocks using various splinting constructions. The periodontogram should be compiled based on clinical and radiological examination data. The numbers in the cells above the dental formula indicate the endurance of the periodontal tissues of the upper jaw teeth, while those below refer to the condition of the periodontal tissues of the lower jaw.

In the first row of cells above and below the dental formula, the coefficients of endurance of healthy, undamaged periodontium are indicated, and then:

- In the second row, coefficients at 1/4 of wall atrophy of the socket.
- In the third row, at 1/2 wall atrophy.
- In the fourth row, at 3/4 wall atrophy.
- In the fifth row, at more than 3/4 wall atrophy.

Data on the condition of the periodontium for each tooth are entered into the periodontogram with conventional symbols in a specific sequence: from the right lower wisdom tooth to the right upper wisdom tooth. After connecting these symbols with straight lines, a graphical curve is obtained, visually depicting the functional state of the periodontium of the upper and lower jaw teeth.

The endurance of the support apparatus of a tooth to pressure is measured with a gnathodynamometer.

In cases of socket atrophy, the periodontal endurance is reduced, more so with greater atrophy. Usually, significant changes in the receptor apparatus of the periodontium occur simultaneously with atrophic processes in the tooth socket. Therefore, due to this and also because of the pathological mobility of the tooth caused by atrophy, it is impossible to determine the actual endurance of the periodontium to pressure.

Hence, the endurance of the periodontium to load during atrophy is calculated using conditional coefficients. These coefficients are based on proportional relationships of the periodontal endurance of various teeth to load, which were established through gnathodynamometry in teeth with intact periodontium.

The periodontal endurance coefficient to load is correspondingly reduced at different degrees of socket atrophy for various teeth.

In the case of IV-degree atrophy, the periodontium does not withstand load (the tooth is subject to removal).

In practice, it is generally accepted that the periodontium of a tooth can withstand twice the load that occurs during processing (e.g., filling). In this case, no reserve force remains, meaning the periodontium can no longer respond adequately if the stimulation during mastication exceeds average values.

With III-degree atrophy, there is pronounced functional deficiency of the periodontium. Clinical observations show that when reserve forces in the periodontium are preserved, pathological processes characterized by periodontium dystrophy proceed asymptomatically. After the reserve forces are exhausted, these pathological processes develop especially acutely.

Interrelationship between periodontal endurance and the degree of atrophy of the socket walls

Degree of resorption	Periodontal endurance
There are no signs of resorption.	The endurance of the periodontium is 100% (with 50% being the physiological reserve)
I degree of resorption (up to 1/4)	The endurance of the periodontium decreases by 25% (75% of the norm remains), the physiological reserve is 25%.
II degree of resorption (up to 1/2)	The endurance of the periodontium decreases by 50% (50% of the norm remains). The physiological reserve is completely absent, but there is no functional insufficiency in the periodontium.
III degree of resorption (up to 3/4)	The endurance of the periodontium is 25%, functional insufficiency is 75% of the endurance.
IV degree of resorption (more than ¾)	The resistance of the periodontium disappears completely.

Selective Tooth Shaping (Occlusal Adjustment) is necessary in cases of periodontal disease in the following situations:

1. Presence of occlusal anomalies and secondary deformities.
2. Uneven wear of the hard dental tissues.
3. Absence of physiological wear of the cusps.

As a result of tooth shaping, premature contacts are eliminated, which normalizes occlusal and articulatory relationships, thereby improving the condition of the periodontium. Tooth shaping is performed under the control of occlusal paper on a turbine drill (speed 300,000–400,000 rpm). To reduce hypersensitivity of the teeth, it is recommended to use a toothpaste with a high fluoride content. In some, more severe cases, a course of treatment with calcium glycerophosphate provides positive effects.

Goals of selective tooth shaping:

1. Eliminate traumatic situations in the periodontium by distributing functional load over as many teeth as possible.
2. Remove trauma to the hard tissues of teeth and pulp.
3. Distribute load along the tooth axis.
4. Reduce pathological activity of masticatory muscles.
5. Eliminate balancing and hyperbalancing supercontacts.
6. Create stable, centered occlusion.
7. Correct occlusal disturbances before prosthetic treatment.
8. Restore functional occlusion after prosthetic treatment.
9. Prevent and treat periodontal pathology, masticatory muscle issues, and temporomandibular joint (TMJ) disorders during deciduous, transitional, and permanent dentitions.
10. Create multiple bilateral contacts during reshaping of teeth in complete removable prostheses (to stabilize the prostheses), while preserving cusp overlap of the lateral teeth (to prevent biting into the cheek mucosa).

Indications for performing occlusal tooth shaping include:

1. Increased masticatory muscle tone (bruxism).
2. Temporomandibular joint dysfunction.
3. Deformations of dental arches and occlusion, including fan-shaped protrusion of the upper and lower incisors.
4. Pronounced mobility of individual teeth.
5. Exposure of the necks or roots of individual teeth due to uneven resorption of the alveolar bone.

Possible complications from selective tooth shaping:

1. Reduction of occlusal height.
2. Orthopedic effect of tooth movement.
3. Hypersensitivity of the hard dental tissues.
4. Loss of contact of some teeth and overload on the periodontium of others.
5. Overheating of the dental pulp.

B. Jankelson proposed a classification of premature contacts. According to this classification, the cusp slope surfaces are designated with Roman numerals I, II, III, and the corresponding antagonist surfaces – Ia, IIa, IIIa:

-Class I: Vestibular slopes of the buccal cusps of the lower molars, premolars, and vestibular surface of the lower anterior teeth.

- Class Ia: Ocular slopes of the buccal cusps of the upper molars, premolars, and ocular surface of the upper anterior teeth.

- Class II: Ocular slopes of the palatal cusps of the upper molars and premolars.

- Class IIa: Vestibular slopes of the lingual cusps of the lower molars and premolars.
- Class III: Vestibular slopes of the palatal cusps of the upper molars and premolars.
- Class IIIa: Ocular slopes of the buccal cusps of the lower molars and premolars.

In patients with orthognathic occlusion, selective tooth shaping is performed for all types of occlusion, including distal. Besides the static phase, i.e., during closure in any occlusion, supercontacts are identified and eliminated in the dynamic phase—during mandibular movements and sliding of dental arches, transitioning from central to anterior, posterior, and transverse occlusion.

The entire process of shaping consists of 12 stages of eliminating supercontacts:
1. In distal occlusion (static phase);
2. During mandibular excursion from distal to centric occlusion;
3. In centric occlusion (static phase);
4. In anterior occlusion (static phase);
5. During mandibular excursion from centric to anterior occlusion (dynamic phase);
6. In lateral occlusion (right and left) on the balancing side;
7. During mandibular excursion from centric to transverse occlusion;
8. In lateral occlusion on the working side;
9. During mandibular excursion from centric to transverse occlusion on the working side;
10. Elimination of supercontacts of canines in lateral occlusion (static phase);
11. Elimination of supercontacts in other regions of the dental arches;
12. Smoothing and polishing all reshaped surfaces of the teeth.

SITUATIONAL TASKS

1. Patient T., 42 years old, visited the clinic with complaints of partial loss of teeth in the lower jaw, mobility of the remaining teeth, and impaired chewing function. He had not previously sought prosthetic assistance. External examination revealed no particularities; temporomandibular joint (TMJ) movements are full and painless.

Dental formula:

4	3	3	0	3	0	0	3		3	0	0	3	3	3	0	4
:18	17	16	15	14	13	12	11		21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41		31	32	33	34	35	36	37	38
4	4	4	0	3	0	0	4		4	0	0	3	3	4	4	4

During inspection, there is hyperemia of the oral cavity mucosa in the area of the lower teeth, with mobility of I–II degree. Kennedy class I defect of the dental arch. X-ray shows bone tissue resorption in the area of lower teeth: 42, 32, 34 on 1/2; 43, 44, 45, 33, 34 on 1/4; no signs of resorption are detected in the upper jaw. Diagnose, analyze the functional status of the teeth, and develop a treatment plan.

2. Patient P., 45 years old, presented with complaints of gum bleeding during brushing, mobility of lower front teeth, and an esthetic defect—absence of tooth 11. He had not previously sought prosthetic help. External examination shows no particularities; TMJ movements are full and painless.

Dental formula:

4	0	3	0	0	3	0	4	0	3	3	3	3	0	3	4
:18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
4	3	0	0	0	3	3	0	3	3	0	0	3	3	0	4

Examination reveals hyperemia of the mucosa in the area of the upper front teeth. Mobility of teeth 11, 21, 22, 31, 32, 41, 42 is I–II degree. Kennedy class III defect of the dental arch. X-ray reveals alveolar ridge resorption in the areas of teeth 11, 21, 22, 31, 41 by 1/2; and in areas of teeth 13, 23, 32, 33, 42, 43 by 1/4. Task: Diagnose, evaluate the functional condition of the teeth, and develop a treatment plan.

3. Patient F., 40 years old, sought the clinic with complaints of partial absence of teeth in the upper jaw and impaired chewing function. Previously, she had not received prosthetic assistance. External examination shows no particularities; TMJ movements are full and painless.

Dental formula:

4	4	3	4	0	0	3	3	3	3	0	3	4	4	0	0
:18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
0	0	0	3	3	0	3	3	0	0	3	3	0	0	0	0

Examination shows the mucosa in satisfactory condition; mobility of teeth 25, 27, 41 is I–II degree. Kennedy class III defect in the upper jaw. X-ray reveals bone tissue resorption in the areas of teeth 16, 27 up to 1/2; and in the areas of teeth 24, 28 up to 1/4. No resorption is observed in the remaining teeth. Task: Diagnose, evaluate the functional status of the teeth, and develop a treatment plan.

4. Patient B., 37 years old, came to the clinic with complaints of mobility of the lateral teeth of the upper and lower jaws on the right side, and pain while eating. He had not undergone any prosthetic treatment before. External examination shows no particularities; TMJ movements are full and painless.

Dental formula:

4	0	0	0	0	0	0	3	0	0	0	3	3	3	3	4
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
3	0	0	3	3	0	0	0	0	0	0	3	3	0	4	4

On examination, slightly hyperemic and swollen mucosa is observed in the area of teeth 15, 16, 17, 45, 46, 47, 48; pathological periodontal pockets of 3 to 4 mm; and mobility of I degree. There is delayed wear of the buccal cusps of the right lateral teeth and presence of premature contacts in lateral occlusion. X-ray shows bone resorption in the area of teeth 15, 16, 17, 45, 46, 47 up to 1/2; no signs of resorption in other teeth. Task: Diagnose, identify possible causes of overload on the periodontium, and develop a treatment plan.

5. Patient L., 34 years old, visited with complaints of hypersensitivity in teeth 14, 15, 24, 25. She reports that a selective tooth filing was performed a week ago. Question: What could be the possible reason for her complaints, and what are the ways to address them?

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.
2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 14

Subject: Temporary and permanent splinting. Orthodontic treatment for periodontal diseases.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To teach students how to determine indications for temporary and permanent splinting in periodontal diseases. To study the structural features of temporary and permanent splints, as well as possible errors and complications during their fabrication. To train students to identify indications and contraindications for orthodontic treatment in patients with periodontal diseases. To familiarize students with the specifics of orthodontic treatment for this patient category, including possible errors and complications.

Objectives of the lesson:

1. Reinforce knowledge about the requirements for temporary and permanent splints.
2. Master methods for manufacturing temporary and permanent splints of various designs.
3. Acquaint with laboratory stages of making temporary and permanent splints.
4. Teach students to determine indications and contraindications for orthodontic treatment in periodontal diseases.
5. Reinforce understanding of potential errors and complications during orthodontic treatment of patients with periodontal diseases.

Class location: the clinical setting.

Practical skills mastered during the class:

Determining indications for temporary and permanent tooth splinting. Selecting appropriate designs.

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 fully master the topic, students should review:

- From anatomy and morphology: the structure and functions of periodontal tissues;
- From prosthetic dentistry (fixed prosthetics): principles of transmitting masticatory load with various types of dental prostheses;
- From general dentistry: new technologies and modern materials used in the fabrication of temporary and permanent splints;

- From periodontology: tissue structure of the periodontium, terminology in periodontology, diagnosis of periodontal diseases, classification of periodontal diseases;
- From orthodontics: orthodontic appliances, classification.

Control questions from related disciplines:

1. Occlusion, articulation, bite.
2. Features of examining patients with periodontal diseases.
3. Radiological diagnostic methods in orthopedic dentistry.
4. Factors affecting periodontal health. Concepts of periodontal disease development.
5. Periodontal tissue resilience to load. Reserve capacity.
6. Odontoparodontogram and its role, structure, and filling rules.
7. Types and principles of action of orthodontic appliances.

Control questions:

1. Indications for temporary and permanent splinting.
2. Requirements for temporary and permanent splints.
3. Types of temporary and permanent splints and their characteristics.
4. Errors and complications during temporary and permanent splinting.
5. Indications and contraindications for orthodontic treatment in periodontal diseases.
6. Features of orthodontic treatment for patients with periodontal tissue lesions.

INDICATIONS FOR TEMPORARY SPLINTING:

- Immobilization of teeth in cases of acute and exacerbated chronic periodontal diseases, accompanied by significant tooth mobility.
- Immobilization of teeth during therapeutic and surgical treatment of periodontal diseases.
- Fixation of the results of orthodontic treatment.
- Prognosis determination for the remaining teeth.

REQUIREMENTS FOR TEMPORARY SPLINTS:

- Reliably fix all teeth included in the splint;
- Distribute masticatory pressure evenly across the supporting teeth;
- Replace dental defects if necessary;
- Not interfere with therapeutic and surgical procedures;
- Not injure the mucous membrane of the oral cavity;
- Be hygienic and free of retention points for dental plaque;
- Be easy and quick to adjust if needed;
- Manufacturing of splints should require minimal preparation of the hard tissues of teeth;
- Not violate aesthetic and phonetic requirements;
- Not disturb occlusal relationships;
- Be simple to manufacture, easy to apply and remove from the dental arches.

TYPES OF TEMPORARY SPLINTS:

- Resin cap splint;
- Multi-link resin splint;
- Ligature tying of teeth;
- Ligature tying with subsequent coating of composite material;
- Adhesive fiber glass splint.

STAGES OF MANUFACTURING A FIBER GLASS SPLINT IN THE ORAL CAVITY:

1. Administration of anesthesia;
2. Preparation of a groove in the hard tissues of the tooth;

3. Fitting the fiber glass ribbon;
4. Application of etching gel;
5. Application of bonding agent;
6. Fixation of the fiber glass ribbon with light-cure composite material;
7. Sanding and polishing the splint.

INDICATIONS FOR PERMANENT SPLINTING:

1. In periodontal diseases after completion of therapeutic and surgical treatment.
2. With alveolar bone atrophy of 1/2 or more.

REQUIREMENTS FOR PERMANENT SPLINTS:

- Ensure reliable immobilization of all teeth included in the splint;
- The splint should form a single block from the group of teeth, which takes and evenly distributes masticatory pressure on the supporting teeth;
- Replace dental defects if necessary;
- Not interfere with therapeutic and surgical treatments;
- Not injure the mucous membrane of the oral cavity or marginal periodontium;
- Be hygienic and free of retention points for dental plaque;
- Be securely fixed to the splinted teeth (for non-removable splints);
- Be biologically compatible;
- Not violate aesthetic and phonetic requirements;
- Not disturb occlusal relationships;
- Manufacturing should require minimal preparation of the hard tissues of teeth;
- Be easily and quickly adjustable if needed.

Characteristics of Removable and Fixed Splints

Fixed Splints	Removable Splints
1. Provide immobilization of teeth in three directions	1. Provide immobilization of teeth in two directions (mesiodistal and vestibulolingual)
2. Most often require preparation of the hard tissues of the teeth, sometimes with prior pulpectomy	2. Usually do not require preparation of the hard tissues of the teeth
3. Faster adaptation.	3. Longer adaptation period.
4. Less disturbance to phonetics	4. More often interfere with speech
5. Less hygienic (complicate individual oral hygiene and serve as retention points for plaque and tartar)	5. More hygienic
6. May hinder therapeutic or surgical treatment of periodontal diseases in the overall treatment plan.	6. Maybe good therapeutic or surgical treatment of periodontal diseases in the overall treatment plan.
7. Cannot restore distal unbounded or extensive defects in dental arches.	7. Can be used in almost all clinical situations
8. In case of tooth extraction, require complete replacement.	8. When teeth are removed, the splint can be repaired without remaking it.
9. Fixed reliably onto the teeth, ensuring constant immobilization.	9. Over time, the splinting effect may decrease if the splint does not fit tightly

FEATURES OF ORTHODONTIC TREATMENT IN PERIODONTAL DISEASES:

- Orthodontic treatment is carried out when alveolar socket wall resorption does not exceed 1/2 and tooth mobility does not surpass Grade 1.

- Strict regulation of orthodontic appliance forces (small forces) to prevent dislocation and loosening of teeth.
- Creating a stable support.
- More frequent visits to the orthodontist to prevent complications.
- Combining orthodontic treatment with comprehensive periodontal therapy.
- Maintaining excellent oral hygiene throughout the entire orthodontic treatment.
- Long-term radiological control of bone level is mandatory during extended treatment.
- Long retention period to prevent recurrences.

SITUATIONAL TASKS

1. Patient C., 47 years old, presented with complaints of bleeding and swelling of the gums, bad breath, and tooth mobility in both the upper and lower jaws. During examination, the following clinical picture was observed: the lower face height is reduced; the mucous membrane in the area of teeth 31, 32, 33, 34, 41, 42, 43, 44 is hyperemic, swollen, and tender upon palpation. Gaseous content is expressed from the periodontal pockets when pressed. Tooth mobility is grade 1-2. Between teeth 41 and 31, a splint made of self-curing plastic is broken. The radiograph shows bone atrophy of 1/2 of the root length in the areas of teeth 31, 32, 33, 34, 41, 42, 43. A temporary plastic splint was fabricated about six months ago. Make a diagnosis. Describe your treatment plan. Name possible errors in the previously performed treatment.

2. Patient N., 45 years old, approached with complaints of interdental spaces in the upper jaw and mobility of lower jaw teeth. External examination shows no notable features; temporomandibular joint movements are pain-free and full. Intraorally, teeth 18, 28, 37, 38 are missing. Clinically, there is grade 2 mobility of the lower incisors, and in the upper jaw, a fan-shaped spacing of teeth with interdental spaces between teeth 13, 12, 11, 21, 22, 23. On the radiograph, bone atrophy of about 1/2 of the root length is seen in areas of teeth 11, 12, 13, 21, 22, 23, 41, 42, 31, 32. Question: Make a diagnosis and develop a treatment plan.

3. Patient I., 38 years old, presented with complaints of bleeding and swelling of the gums, and dental pain during eating. According to the patient, she has been undergoing orthodontic treatment for about six months to correct a distal bite. External examination shows no notable features; TMJ movements are pain-free and full. A multibonding system is fixed on the teeth of the upper and lower jaws. The mucous membrane in the area of the maxillary anterior teeth is hyperemic, swollen, and tender upon palpation. The radiograph shows an expansion of the periodontal spaces and bone atrophy exceeding 1/2 of the root length in the area of teeth 41, 42, 43, 31, 32, 33. Question: What errors were made during previous treatment stages, and what actions will you take to address them?

4. Patient K., 35 years old, presented with complaints of trauma to the oral mucosa from the lower teeth on the hard palate, diastema, and interdental spaces in the upper jaw, as well as cracks at the corners of the mouth. She reports that about 1.5 years ago, orthodontic treatment using a multibonding system was initiated. After a year of orthodontic treatment, positive results were achieved: diastema and interdental spaces were eliminated, cracks at the corners of the mouth disappeared, and treatment was then completed. External examination revealed a reduction in the height of the lower face by 3 mm; TMJ movements are pain-free and full. The mucous membrane near the maxillary anterior teeth is hyperemic, swollen, tender upon palpation; supra- and subgingival dental deposits are present. He radiograph shows bone atrophy of 1/4 of the root length in the areas of teeth 41, 42, 31, 32. On the palate, near the necks of the maxillary anterior teeth, chronic trauma is observed. Question: Why did a relapse occur? What was not done to prevent it?

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

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

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

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6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 15

Subject: Dental implants. Types. Structural materials. Indications and contraindications for use**.**

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To teach students to apply various methods of patient examination when planning treatment involving dental implants, to instruct them on indications and contraindications for implantation, and to familiarize students with different types of dental implants.

Objectives of the lesson:

1. To teach students the general principles of patient examination in treatments using dental implants.
2. To teach students the general principles of planning prosthetic treatment with dental implants.
3. To familiarize students with the main types of dental implants used in clinical practice for restoring the integrity of the dental arch.
4. To inform students about the indications and contraindications for prostheses supported by dental implants.

Class location: the clinical setting.

Practical skills mastered during the class:

Selection of the type of dental implant depending on the clinical situation.

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 fully master the topic, students should review:

- From anatomy: the anatomical structure of the upper and lower jaws in relation to age and post-extraction.
- From general dentistry: materials used in prosthetics and laboratory techniques for fabrication.
- From radiological diagnostics: methods of radiographic examination of the dento-maxillofacial system.

Control questions from related disciplines:

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

Control questions:

1. Patient examination and diagnosis with partial and complete edentulism in prosthetic treatment using implants.
2. Types of bone tissue according to S. Mish.
3. Types of dental implants and their characteristics (classification, types).
4. Structural components of dental implants.
5. Indications and contraindications for prosthetic treatment with dental implants.
6. Requirements for prostheses used after dental implantation.

The use of intraosseous implants opens broad opportunities for restoring the integrity of the dental arches, as well as serving as an effective method to prevent jaw atrophy and secondary deformities of the dentoalveolar system. Over the past decade, dental implantology has experienced rapid development as a distinct discipline, thereby expanding possibilities in restorative dentistry, particularly in improving the quality of defect correction in dental arches. Orthopedic structures on osseointegrated implants are most capable of ensuring normal masticatory function, anatomical and physiological comfort for the patient, social and professional well-being, and confidence in oneself.

The procedure for restoring the integrity of dental arches using implants involves addressing the challenge of individual selection for each patient, taking into account the conditions of their future function within the system: bone tissue—implant—orthopedic structure. These conditions determine the choice of specific morphometric characteristics of the implants, including diameter, length, and the parameters of macro- and microrelief. However, in some cases, factors such as insufficient bone volume and/or low bone density complicate the process of recreating an adequate anatomical relationship of the oral cavity structures.

Based on this, today there are two clearly defined trends in developing treatment strategies for patients through the installation of dental implants:

1. Local augmentation of bone density and/or restoration of bone volume using alternative methods of forming the implant osteotomy.
2. In cases of low bone density and/or deformation—modifying the size parameters of the implant and selecting its macrorelief.

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

Type D1 — Thick cortical bone with a bone density greater than 1250 units on the Hounsfield scale (e.g., anterior region of atrophied edentulous lower jaw) provides good primary stability of the implant and larger contact area with bone structures, but complicates osteotomy preparation and prolongs reparative regeneration due to poor vascularization.

Type D2 — Thick bone with a uniform mixture of cortical and cancellous tissue, with a bone density from 850 to 1250 units on the Hounsfield scale (e.g., alveolar part of the lower jaw), offers ideal conditions for dental implantation.

Type D3 — Thin bone with a porous cortical layer and spongy cancellous tissue, with a bone density from 350 to 850 units (e.g., alveolar process of the upper jaw, good condition after bone plastic surgery), is associated with good blood supply but reduced contact area with

mineralized structures, necessitating multiple implants and the use of bone compaction methods during osteotomy formation.

Type D4 — Very thin cortical bone and a layer of very spongy bone, with a bone density less than 350 units on the Hounsfield scale (e.g., tuberosity of the upper jaw, satisfactory condition post-bone plastic surgery), is considered the most challenging for implant placement.

A convenient rule for the diagnostic stage in dental implantology is segmental registration of diagnostic indicators and planned treatment (Mirgazisov M.Z., 2003; Ivanov S.Yu. et al., 2003). For each alveolar segment of a missing tooth, the following are recorded: bone type, parameters of the potential implant depth, implant diameter, and the recommended prosthetic construction. Additionally, the need for reconstructive bone surgery of the jaw can be indicated.

Dynamics of formation of the osseointegrated contact

Phase I: Healing (reparative regeneration) of the bone tissue of the recipient socket		
Time after surgery	**Regeneration Stage**	**Morphological Characteristics**
0–12 hours	Primary Tissue Response	Hemorrhage, formation of blood clots in the marrow spaces and necrotic zone of the recipient socket, adhesion of blood cells and plasma proteins (fibronektin and vitronectin) to the surface of the implant
12–48 hours	Acute Inflammation	Migration of polymorphonuclear leukocytes and macrophages. Formation of granulation tissue in the marrow spaces and partially in the necrotic zone
2–5 days	Initiation of Primary Osteogenesis	Beginning of proliferation of capillaries and osteogenic cells on the periosteal and endosteal surfaces of the bone tissue adjacent to the implant. Differentiation of osteogenic cells into osteoblasts occurs in areas where capillary proliferation is active and blood circulation is restored. In areas with insufficient blood supply, osteogenic cells differentiate into chondroblasts and fibroblasts.
1–3 weeks	Initiation of Secondary Osteogenesis	Osteons and trabeculae in the necrotic zone undergo osteoclastic resorption. Osteoblasts on the endosteal and periosteal surfaces of the bone synthesize collagen and connect with osteocytes in viable areas of trabeculae and osteons via their processes.
3–6 weeks	Formation of Osteoid	On endosteal and subperiosteal surfaces, the synthesis of organic bone matrix by osteoblasts is completed, followed by mineralization. At sites where osteons are resorbed, osteoblasts begin collagen synthesis
6–8 weeks	Completion of Reparative Regeneration	Damaged osteons and trabeculae of the necrotic zone are partially replaced with mineralized coarse-fibered bone tissue. The bone healing process is completed.

Phase II: Structural reorganization (functional regeneration) of bone		
Time since onset of function	**Regeneration Stage**	**Morphological and Functional Characteristics**
1–2 weeks	Initiation of Structural Reorganization	Under functional load, due to piezoelectric and electrokinetic effects on the surfaces of individual structural bone elements interacting with the implant, osteoclastic resorption of areas of osteons and trabeculae composed of coarse-fibered bone is activated.
2–12 weeks	Formation of Platelet Bone Tissue	In resorbed areas, osteoblasts synthesize collagen fibers aligned with the load vector and arranged in parallel arrays. Following collagen synthesis, organic matrix mineralization occurs.
3–18 months	Modification of Bone Architecture	Resorbed coarse-fibered bone tissue is replaced by lamellar (platelet) bone adapted to functional load. The formation process involves reorientation of trabeculae and volume increase.
Up to 25 years	Stabilization of Osteogenesis and Osseointegration	After maturation of bone tissue, a quiescent phase of osteogenesis occurs, lasting up to 25 years. This state is observed when load magnitude and function pattern remain unchanged, and hormones regulating mineral exchange maintain calcium homeostasis

Currently, the dentist has a wide range of implant options with significantly different characteristics. Attention should be paid to the shape of the implant body, as different shapes are recommended for installation in bone tissue of varying density. Today, the most common shapes of endosseous screw implant bodies are cylindrical, which are recommended for placement in dense bone—D1–D2; tapered, recommended for placement in bone tissue of grades D2–D4; and conical, suitable for installation in bone types D3–D4. Additionally, there is a correlation between the surface area of the implant and the specific shape of its body. The maximum surface area is characteristic of the cylindrical body shape, smaller for the tapered shape, and the smallest for the conical form.

Options for Intrabony Implant Designs

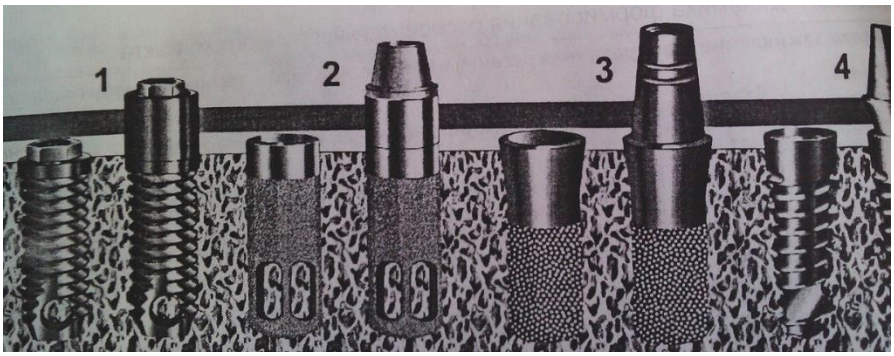

Fig. 15.1. Construction of Intrabony Implants, Variant A

A – Two-stage implants:

1 – One of the most common screw-type implants worldwide: Branemark;

2 – Cylindrical implant IMZ with a shock absorption system, developed by A. Kirsch in 1980;

3 – One of the first domestic two-stage implants — Smirnov's implant with a porous intrabony part;

4 – Conical screw-type implant of the "Radix" system.

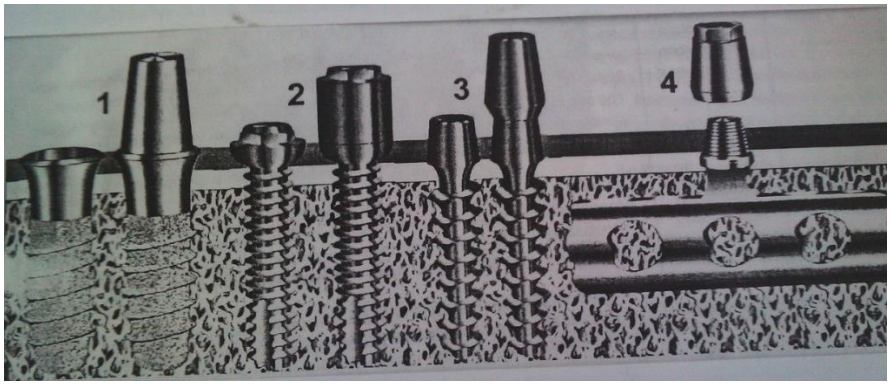

Fig. 15.2. Construction of Intrabony Implants, Variant B

B – Detachable single-stage implants:

1 – Bonefit system implant with a textured plasma-sprayed surface of the intrabony part;
2 – Latest version of Branemark implants with an intrabony diameter of 2.5 mm;
3 – Radix-DM implant with an intrabony diameter of 2.8 mm;
4 – Radix-BL plate-type detachable implant.

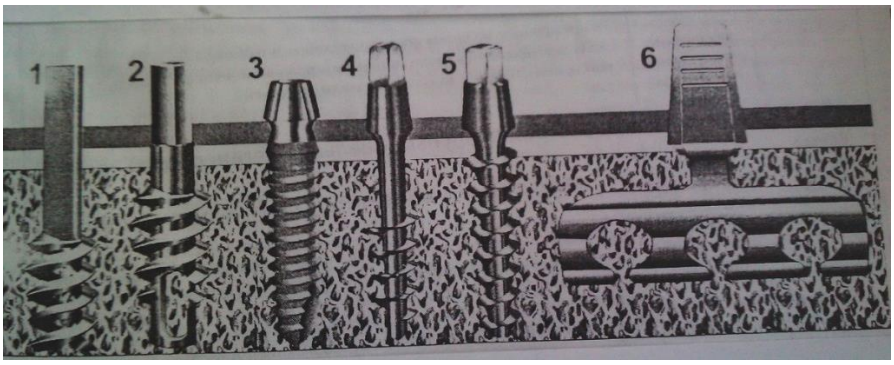

Fig. 15.3. Construction of Intrabony Implants, Variant C

C – Non-detachable implants:

1 – One of the first intrabony implants — Chercheve implant;
2 – Screw-type implant invented in 1962 by L. Linkov;
3 – Implants textured with plasma spraying;
4 – "Drill-like" type implant developed by Tramonte in 1964;
5 – Radix-I implant with a three-sided anti-rotation feature;
6 – Classic plate-type implant by L. Linkov.

INDICATIONS AND CONTRAINDICATIONS FOR DENTAL IMPLANTATION

Indications for dental implantation include clinical scenarios of secondary edentulism:

- Absence of a single tooth in the anterior region;
- Limited localized dental defects;
- Unilateral and bilateral end-to-end dental defects;
- Complete absence of teeth, especially with reduced alveolar ridge height;

- Intolerance to removable dentures due to heightened sensitivity to acrylics or severe gag reflex;
- Lack of functional occlusion and, consequently, the occurrence of temporomandibular joint (TMJ) dysfunction pain syndrome.

During the patient's history collection, complaint assessment, and oral examination, absolute and relative contraindications to dental implantation are identified.

Absolute Contraindications:
- Blood and hematopoietic system diseases;
- Central nervous system diseases (congenital and acquired);
- Malignant neoplasms of organs and systems;
- Immunopathological conditions;
- Systemic connective tissue diseases;
- Tuberculosis;
- Diseases of the ORL tract (chronic recurrent aphthous stomatitis, lupus erythematosus, pemphigus, Sjögren's syndrome, etc.);
- Bruxism, hypertonicity of masticatory muscles;
- Type I diabetes.

Relative Contraindications:
- Unsatisfactory oral hygiene and incomplete oral sanitation;
- Gingivitis of various etiologies;
- Marginal periodontitis;
- Bite anomalies;
- Arthro-arthrosis of the temporomandibular joints;
- Pronounced atrophy or bone defect of the alveolar ridge;
- Harmful habits;
- Pregnancy.

SITUATIONAL TASKS

1. Patient K., 16 years old, presented with complaints about gum trauma in the area of the extracted tooth 16. The tooth was removed 5 years ago. The remaining teeth of the upper and lower jaw are intact. What type of prosthetic design is most appropriate in this situation?

2. Patient A., 27 years old, complained of aesthetic deficiency. During oral examination, tooth 12 is missing (extracted due to chronic granulomatous periodontitis); the other teeth are intact, and the occlusion is orthognathic. Medical history includes diabetes mellitus and persistent bruxism. Propose a treatment plan for the prosthetic correction of this dental defect.

3. Patient B., 35 years old, approached for implant-supported prosthetics in the area of tooth 45, which was extracted a year ago. What diagnostic methods should be prescribed, and which specialists' consultations are necessary?

4. The patient R. underwent implantation in the area of missing teeth 15 and 16, followed by the fabrication of crowns made of CAD/CAM material. How long after prosthetics should the functional state of the implants be evaluated?

5. Patient P., 55 years old, complained of pain in the right temporomandibular joint (TMJ). Palpation of the TMJ revealed pain on the right side. Palpation of the masticatory muscles shows tenderness in the m. masseter, right; m. temporalis, right; and m. pterygoideus lateralis, right. Examination of the oral cavity reveals missing teeth 35, 36, 37, 45, 46, 47. The occlusion is orthognathic. Diagnosis: Arthro-arthritis of the TMJ, partial secondary edentulism of the lower jaw (Kennedy Class I). Propose a rational treatment plan.

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 16

Subject: Orthopedic treatment of patients with partial anodontia with fixed dental prostheses supported by cement-retained 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	**58**
6.	Final stage	**13**

Purpose of the lesson: To teach students the methodology of prosthetic treatment for patients with partial tooth loss using fixed dental prostheses supported by dental implants with cement retention.

Objectives of the lesson:

1. Familiarize with indications and contraindications for the fabrication of fixed dental prostheses supported by dental implants with cement fixation.
2. Understand the features of designing prostheses supported on dental implants with cement fixation.
3. Acquire practical skills in manufacturing fixed dental prostheses supported by dental implants with cement fixation.
4. Learn about common errors and complications in the prosthetic treatment of patients with partial tooth loss using fixed dental prostheses supported by dental implants with cement fixation.

Class location: the clinical setting.

Practical skills mastered during the class:

Planning prosthetic treatment for edentulous patients with fixed implant-supported dental prostheses using cone-beam computed tomography (CBCT).

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 fully master the topic, students need to review:

- From human anatomy: anatomical structure of the upper and lower jaws;
- From histology, cytology, embryology: morphological changes in jawbone tissue after tooth loss;
- From materials science: clinical materials science and laboratory techniques;
- From surgical dentistry: implant surgery procedures.

Control questions from related disciplines:

1. Anatomy of the maxillary structure in relation to age and after tooth extraction.
2. Anatomy of the mandibular structure in relation to age and after tooth extraction.
3. Methods of radiological examination of the dento-maxillary system.
4. Alloys used in dentistry and the requirements for them.

Control questions:

1. Indications and contraindications for the fabrication of fixed dental prostheses supported by dental implants with cement fixation.
2. Cements used for fixation of prosthetic structures supported by dental implants.
3. Features of designing prostheses supported on dental implants with cement fixation.
4. Clinical and laboratory stages of manufacturing fixed dental prostheses supported by dental implants with cement fixation.
5. Errors and complications in the prosthetic treatment of patients with partial tooth loss using fixed dental prostheses supported by dental implants with cement fixation.

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

Clinical Stages	Laboratory Stages
Obtaining preliminary (anatomical) impressions of both jaws, pouring models	
	Fabrication of a custom tray for obtaining the working impression
Fitting the tray, obtaining the functional (working) impression, determining the centric occlusion	
	Pouring the working model, mounting models in an articulator
	Selection and milling of abutments
	Designing the framework of the prosthesis
	Casting, processing the framework, fitting the framework on the model
Fitting the framework in the clinic, selecting the shade of the veneer	
	Fitting the prosthesis in the clinic
Applying the veneer	

Obtaining impressions and fabricating working models can be performed using several methods. If non-removable implants were used and their heads were individually corrected intraorally through preparation, then it is necessary to obtain a traditional double-layer impression followed by casting of a standard removable model, in which the implant head is represented in plaster.

However, prosthetic work on dental implants demands higher precision standards. The most advanced technology for manufacturing dental prostheses is the use of removable implant systems with additional orthopedic components, resulting in a non-cutting (solid) plaster model.

Additional orthopedic elements of the implant system include:

- Impression modules and laboratory analogs of the implant
- Modeling caps

Each implant system implies its own original components, precisely matching each other. Many system manufacturers adopt a multi-variant approach, where various types of implants with identical orthopedic elements are installed on the same patient for prosthetic purposes. An example is the "multi-implant" concept by Oraltronics, which combines removable and non-removable screw- and plate-type implants with a wide variety of interchangeable heads.

Impression modules are fixed into the intra-bony part of the implant just before applying the impression tray with impression material.

The conventional "closed" technique involves using impression modules roughly matching the size of teeth. After removing the closed impression from the mouth, the impression module remains on the implant, then it is unscrewed, and an implant analog is attached to it and placed into the impression.

Closed impressions are usually made with dual-layer materials:

- First, a base layer,
- Then, a corrective layer.

This method is often used when the prosthesis has a small number of support units parallel to each other with minimal deviations from parallelism (deviation angle should not exceed 10 degrees). These are most suitable when both implants and natural teeth serve as prosthetic support.

Open impression technique involves using large plastic trays and impression modules, with holes cut into the tray corresponding to the modules' positions. When fitting the impression tray, the outer edges of the impression modules pass through it. After the impression material sets, the fixation screw of the impression modules is unscrewed, and the impression is removed from the mouth along with the impression modules, to which implant analogs are then attached.

This type of impression is obtained by simultaneously introducing two different-consistency materials: the less flowable material is placed on the tray, and the more flowable material is injected around the implants ("sandwich technique"). Alternatively, a special material for single-layer impressions, Impregum, can be used.

After obtaining the impression, the area of the implant location that overlaps the border of the impression module and the implant analog is filled with a special material—gingival mask (e.g., Gi-mask). This material easily separates from plaster, facilitating precise and comfortable dental laboratory work on the implant.

Determination of the centric occlusion and the optimal intermaxillary relationship is performed using standard methods. In complex clinical cases, these procedures should be conducted with the help of a facebow and individual adjustments on an articulator.

The process of constructing a dental prosthesis is largely determined by its fixation method to the implant. There are three main types:

1. Permanent fixation – the prosthesis is cemented onto the implant heads.
2. Conditionally removable prostheses – fixed with screws passing through the artificial crown and attaching it to the implant head, with the screw channel sealed with filling material.
3. Removable prostheses – held relative to the implants through various locking attachments.

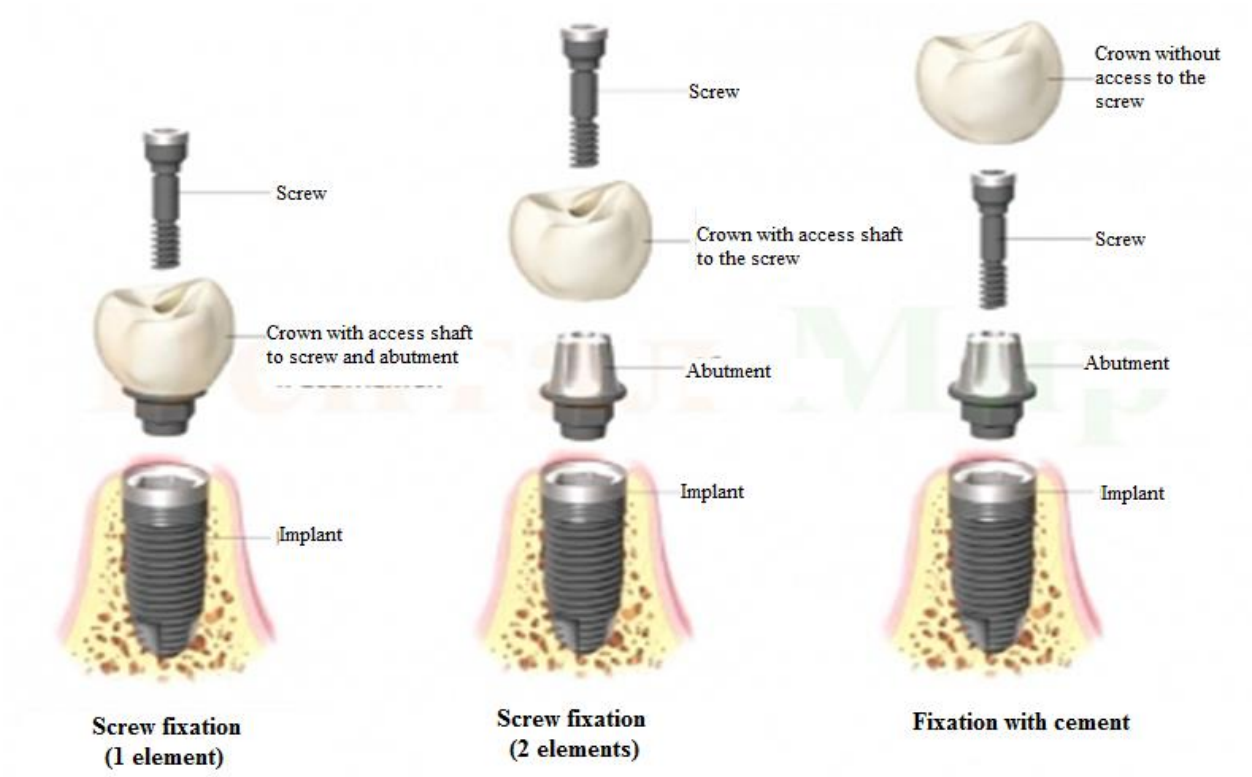

Fig. 16.1. Types of fixation

Fixation with cement:

On an installed implant, an abutment is fixed with a screw, on which a crown is attached using dental cement.

Advantages of cemented crowns:

- Optimal cost;
- Simple installation process;
- Excellent occlusion;
- Good solution for bridge prostheses.

Disadvantages of cemented crowns:

- Compromised seal integrity;
- Difficult to repair;
- Excess cement can cause complications, and removing excess cement is a complex and insufficiently controlled process.

DYNAMIC MONITORING OF PATIENTS WITH IMPLANTS

After fixing the finished prosthesis in the oral cavity, the stage of dynamic monitoring of functioning dental implants begins. During this period, the patient must perform adequate hygienic care of the parts of the implant and prosthesis that protrude above the gum level. To this end, specially manufactured cleaning kits should be used. In addition to regular toothbrushes, special inclined single-bristle brushes, soft children's brushes, electric toothbrushes, brushes with nylon fibers, and brushes with magnetically charged water are used.

For dentifrices, it is advisable to select those characterized by low abrasiveness and containing components for the prevention of inflammatory processes. To clean hard-to-reach areas, patients should use interdental brushes, manual dental picks, floss, and strips—collectively referred to as "floss."

Thorough mechanical cleaning should be performed from all sides of the prosthesis, paying special attention to those parts of the structure that are in contact with the gum. In these areas, the use of dentifrices is not recommended. Instead, it is better to moisten the brush with antiseptic solutions (for example, a 0.1% chlorhexidine solution).

Special oral hygiene kits are produced for these purposes, allowing for irrigation and jet cleaning of teeth, gums, and prostheses.

Hygienic procedures in the oral cavity should be complemented by rinsing with antiseptic solutions, herbal decoctions, and elixirs with bacteriostatic and anti-inflammatory effects.

Management of patients with dental implants involves regular clinical examinations of oral hygiene and performing professional cleaning procedures. During these visits, it is important to evaluate periodontal and hygiene indices. The patient should receive necessary recommendations from the dentist regarding oral care.

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 polishing tools operated by electrical drives using low-abrasion polishing pastes. These procedures are performed by a periodontist or hygienist at intervals of 1 to 4 times per year.

Ultrasound is a rational physiotherapeutic tool for professional hygiene. Ultrasonic cleaning techniques can be applied both directly in the oral cavity for fixed prostheses and in special baths for conditionally removable and removable structures. However, contact between ultrasonic instruments and titanium surfaces should be avoided.

When removing conditionally removable dental prostheses, implant heads covered with large amounts of hard deposits and with rough surface polishing irregularities are replaced with similar new structures. Over time, it is recommended to replace all fixing screws.

Actions aimed at normalizing the hygienic status constitute the first component of clinical care for dental implants.

A second equally important aspect of prosthetic maintenance is the regular check of occlusal relationships and their correction through selective adjustment of the natural and artificial teeth if necessary.

Dynamic observation of implants involves regular assessment of osseointegration. The condition of the tissues around the implant begins with probing the peri-implant sulcus. An acceptable depth is considered to be 4 mm. Bleeding that appears during probing can be an early sign of dysfunction.

The next indication of compromised integration is pronounced gingival hyperemia and edema around the implant, as well as its mobility.

Clinically, the stability of dental implants is assessed using palpation and percussion methods. There should be no manual signs of mobility, and the percussive sound should not be dull.

The resilience of the surrounding tissues to loads can be tested using mechanical or electrical gnathodynamometers, such as the "Vizhyr" and "Vizhyr E 1000" devices.

The adaptation of bone to loaded implants is also tested using ultrasound—this method is called echoosteometry or ultrasound densitometry. This examination allows for a rapid assessment of the bone tissue density around the implant area.

It can be performed using the Russian device "Echoosteometer EOM-01c."

Other effective assessment methods include rheography, polarography, Doppler ultrasound, and photoplethysmography.

As criteria for evaluating the success of implantological treatment, implant functionality indicators (PFI) should be used, which were proposed by M.Z. Mirgazisov and are expressed with values from "1" to "0":

1 – The implant is immobile or mobile within the physiological compliance of the tissue; there are no signs of gingival inflammation or periodontal pockets.

0,75 – Periodic mobility of the implant of I–II degree occurs; the gingival inflammation process appears and disappears; no periodontal pocket is present (compensation stage).

0,5 – Persistent mobility of the implant of I–II degree; formation of a periodontal pocket (subcompensation stage).

0,25 – Mobility of the implant of III degree; pronounced periodontal pocket (decompensation stage).

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

A justified assessment and prognosis of the results of dental implantation are conducted one year after the fixation of the prosthesis to the implants. Regarding specific treatment durations with implants, there are international standards indicating that positive functional and aesthetic outcomes of dental row restorations should be achieved in 90–95% of patients at 5 years, 85% at 10 years, and 80% at 15 years.

SITUATIONAL TASKS

1. When fixing a metal-ceramic crown onto an abutment, the dentist used Fuji Plus glass ionomer cement. Assess the dentist's approach.

2. During the impression-taking process for the implants, the dentist used A-silicone impression material. However, the impression did not meet quality requirements: poor adhesion to the tray, unclear contours of the natural tooth and gingival margins in the implant areas. What could be the reason for the poor impression quality?

3. When taking an impression of implants with divergence in the areas of missing teeth 45 and 46, using a direct transfer method, deformation and damage occurred to the impression material. Who was responsible for this mistake (the dentist or the dental technician), and what are the ways to correct it?

4. During the dynamic observation of patient N., 47 years old, after implantation, mobility of the implant was detected in the area of missing tooth 37. Possible cause of implant mobility and ways to address it.

5. Patient K., 47 years old, presented with complaints of discomfort when using a partial removable prosthesis in the lower jaw. Diagnosis: partial secondary edentulism of the lower jaw (Kennedy Class I). Examination revealed the absence of teeth 34, 35, 36, 37, 45, 46, 47. The occlusion is orthognathic. Name possible options for dental prosthesis designs using implants.

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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

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

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6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 17

Subject: Orthopedic treatment of patients with partial anodontia with fixed dental prostheses supported by dental implants with screw fixation.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To teach students the methodology of orthopedic treatment for patients with partial tooth loss using fixed dental prostheses supported by dental implants with screw retention.

Objectives of the lesson:

1. To familiarize students with indications and contraindications for the fabrication of fixed dental prostheses supported by dental implants with screw fixation.
2. To understand the features of designing prostheses supported by dental implants with screw fixation.
3. To acquire practical skills in manufacturing fixed dental prostheses supported by dental implants with screw fixation.
4. To learn about common errors and complications in orthopedic treatment of patients with partial tooth loss using fixed dental prostheses supported by dental implants with screw fixation.

Class location: the clinical setting.

Practical skills mastered during the class:

Planning orthopedic treatment for edentulous patients with fixed dental prosthetic constructions supported by dental implants, using cone-beam computed tomography (CBCT).

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 fully master the topic, students should review:

- From human anatomy: the anatomical structure of the maxilla and mandible;
- From histology, cytology, embryology: morphological changes in jawbone tissue after tooth loss;
- From materials science: clinical materials science and laboratory techniques;
- From surgical dentistry: implant surgery.

Control questions from related disciplines:

1. Anatomy of the maxilla in relation to age and after tooth extraction.
2. Anatomy of the mandible in relation to age and after tooth extraction.
3. Methods of radiological examination of the dentoalveolar system.
4. Alloys used in dentistry and their requirements.

Control questions:

1. Indications for the fabrication of fixed dental prostheses supported by dental implants with screw retention.
2. Contraindications for the fabrication of fixed dental prostheses supported by dental implants with screw fixation.
3. Features of designing prostheses supported by dental implants with screw fixation.
4. Clinical and laboratory stages of manufacturing fixed dental prostheses supported by dental implants with screw fixation.
5. Errors and complications in orthopedic treatment of patients with partial tooth loss using fixed dental prostheses supported by dental implants with screw fixation.

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

Clinical Stages	Laboratory Stages
Obtaining preliminary (anatomical) impressions of both jaws, pouring models	
	Fabrication of a custom tray for obtaining the working impression
Fitting the tray, obtaining the functional (working) impression, determining the centric occlusion	
	Pouring the working model, mounting models in an articulator
	Selection and milling of abutments
	Designing the framework of the prosthesis
	Casting, processing the framework, fitting the framework on the model
Fitting the framework in the clinic, selecting the shade of the veneer	
	Applying the veneer
Fitting the prosthesis in the clinic	

Prosthetics on dental implants require higher standards of precision.

The most advanced technology for fabricating dental prostheses involves the use of removable implant systems with additional orthopedic components and obtaining a non-cutting gypsum model.

Additional orthopedic elements of the implant structure include

a custom impression module, a laboratory analog of the implant, and a modeling cap. Each implant system features its own original components, precisely matching each other. Many system manufacturers adopt a multi-type approach, allowing different types of implants with identical orthopedic elements to be used for the same patient’s prosthetic treatment. An example is the "multi-implant" concept by "Oraltronics," which combines removable and non-removable screw-retained and plate-supported implants with a wide variety of interchangeable head options.

Impression modules are fixed to the intra-bony part of the implant just before applying the impression tray with impression material. The conventional "closed" impression technique

involves using impression modules roughly matching the size of natural teeth. After removing the closed impression from the mouth, the impression module remains on the implant, then it is unscrewed, and an implant analog is attached and inserted into the impression.

Closed impressions are usually made with two-layer materials:

first, a base layer, then a corrective layer. This method is often used when the number of supporting units for the prosthesis is small, parallel to each other, with minimal divergence (the angle of divergence should not exceed 10 degrees). These are most suitable when both implants and natural teeth serve as supporting abutments for the prosthesis.

Open impression methods are performed using large plastic trays and impression modules, with holes cut into the tray corresponding to the modules' position. When seating the impression tray, the outer edge of the impression modules passes through the tray. After the impression material sets, the fixation screw of the impression modules is unscrewed, and the impression is removed from the mouth along with the impression modules, to which implant analogs are then attached.

This type of impression is obtained through the simultaneous placement of two different viscous materials: the less flowable material is placed on the tray, and the more flowable material is injected into the implant area—this is known as the "sandwich technique."

Another option is the use of special material for single-layer impressions, such as "Impregum".

The open impression method is mandatory when multiple implants are used, making parallelism difficult or impractical to achieve.

After impression acquisition, the area of the implants that overlaps the border of the impression module and the implant analog is filled with a special material—usually a gingival mask (e.g., "Gi-mask"). This material easily separates from the gypsum, allowing for convenient and precise dental laboratory work on the implant.

Determination of the central occlusion and the central relationship of the jaws is performed using standard methods.

In complex clinical cases, these procedures should be conducted with the aid of a face bow and individual adjustment of the articulator's parameters.

The process of constructing a prosthetic structure is largely determined by its fixation method to the implant.

There are three basic types of fixation:

1. Non-removable fixation: Prostheses are cemented to the implant abutments.
2. Conditionally removable prostheses: Fixed with screws passing through the artificial crown and attaching it to the implant abutment, with the screw channel sealed with filling material.
3. Removable prostheses: Retained relative to the implants using various types of clasping attachments.

Screw fixation involves attaching the crown to the abutment beforehand in laboratory conditions, and then securing the finished structure onto the implant. A screw is used for the connection, which is inserted into a vertical hole passing through both the crown and the abutment. After placement and tightening of the crown, a hole remains on the chewing surface (known as the screw channel) — this is sealed with composite material.

Fig. 17.1. Screw fixation

The choice of fixation method is made by the specialist at the treatment planning stage. The success of the procedure depends on how precisely the crown is planned to fit onto the implant.

A significant argument in favor of cemented fixation is its lower cost. Despite this, dentists increasingly prefer screw fixation because this method offers advantages over cemented solutions.

Advantages of screw fixation

No residual cement on the abutment. When a crown is cemented, some cement may extrude into the space between the abutment and the gum. Even a thin film of cement can over time cause inflammation of the surrounding tissues because it prevents proper tissue adaptation to the implant.

Precise fit of the crown to the abutment: If any inaccuracies occurred during fabrication, the crown may not fit tightly onto the abutment. This is often difficult to control during cementing. Over time, cement in the gap between the crown and abutment can be washed out, replaced by bacterial plaque, leading to inflammation.

With screw fixation and the use of digital equipment, the crown is "shaped" to the abutment, with any deviations corrected during the preparation phase.

Strength of fixation: Attaching the crown to the implant with a metal screw is much stronger and more reliable than using cement.

Ease of repair: In case of necessity, filling material above the screw can be drilled out, allowing disassembly of the screw structure. Once the issue is resolved (such as replacing prosthetic parts, tightening the screw, or performing therapeutic procedures), the crown can be reattached.

A cemented crown must be cut off, requiring the fabrication of a new crown and sometimes an abutment. Additionally, if the crown was removed improperly, there is a risk of damaging the implant.

Convenience in multi-implant bridges: When restoring with a bridge on multiple implants, screw fixation is almost unparalleled. Cemented bridges on implants are much harder to service.

Disadvantages of screw fixation

Despite many positive qualities, screw fixation has some drawbacks:

Presence of a screw hole on the chewing surface: If an inappropriate composite material is chosen, it creates an aesthetic defect. This is considered a conditional disadvantage since the defect can be covered with composite.

Risk of screw loosening and crown or abutment mobility: If the patient does not seek timely dental care, peri-implantitis may develop. This also means that periodic dental examinations become even more important.

Risk of screw fracture: If the screw loosens and the crown becomes mobile, and if ignored for a long time, the screw may break. Extracting a broken screw is very difficult, and this situation can lead to implant removal.

Laborious and complex fitting of screw components: Installing a crown by screw fixation requires a high level of qualification from the dentist. The dentist must also have a special key to adjust the torque applied during screw tightening to avoid mechanical stress in the structure.

High cost: The complexity of fabrication and installation results in higher prices for screw-retained crowns compared to cemented ones.

Indications for screw fixation of crowns

Screw fixation of crowns on implants is applied based on the requirements of the specific clinical situation. Most often, it is used in the following cases:

1. When the tissue thickness at the site of the artificial tooth installation is 2 mm or less (not always);
2. If a bridge prosthesis consists of two or more crowns on multiple implants;
3. During treatment with protocols such as All-on-4 or All-on-6, screw fixation is provided by the treatment protocol itself;
4. If the patient exhibits a short clinical crown height.

Types of crowns for screw fixation

A metal-ceramic crown consists of two layers: metallic and ceramic. These crowns have good aesthetics, resistance to external chemical and mechanical impacts, high strength, and long service life. Titanium abutments are used with metal-ceramic crowns; depending on the situation, they can be standard or custom-made.

Crowns are fabricated in a dental laboratory using a gypsum model of the jaw. Initially, wax modeling of the crown is performed, then a metal framework is cast from titanium, cobalt-chromium, or gold-platinum alloy. Afterward, several layers of ceramic are applied to the metallic base. The finished crowns are connected to abutments, checked for precise fit on the gypsum model, and then installed onto the implant.

Zirconia crowns are more expensive than metal-ceramic ones but have better functional characteristics: biocompatibility, lightness, aesthetics, high durability, and hypoallergenicity. The appearance of zirconia crowns closely resembles natural teeth due to the optical properties of zirconia; during fabrication, a natural color and translucency can be achieved. High aesthetics are ensured by using ceramic abutments, which do not show through the crown material.

Zirconia crowns are manufactured in technical laboratories on milling machines using CAD/CAM systems, which involve computer technologies at all stages of production.

SITUATIONAL TASKS

1. Patient T., 50 years old, complained of mobility of the orthodontic structure fabricated on implants. Examination revealed micro-gaps between the inner surface of the crown and the abutment of the supporting implant. Name the cause of the mobility of the orthodontic structure.
2. During impression taking on implants, the doctor used C-silicone impression material. The resulting impression did not meet quality requirements: unclear margins of the natural teeth and marginal gingiva in the implant area. What could have caused the poor quality of the impression?
3. Patient T., 55 years old, complained about unsatisfactory aesthetics. During examination, a composite material was found on the buccal surface of the prosthetic structure supporting implant

in the area of tooth 11, covering the screw access hole. Was the mistake made by the dentist or the dental technician? Name possible ways to correct it.

4. During dynamic follow-up of patient B., 57 years old, after implant placement and prosthetics, mobility of the prosthetic structures was observed, as well as an excessive bite in the area of missing teeth 36 and 37. Possible causes of the mobility and ways to address it.

5. Patient K., 50 years old, reported discomfort when using a partial removable prosthesis on the upper jaw. Diagnosis: partial secondary edentulism of the upper jaw (Kennedy Class I). Oral examination revealed absence of teeth 13, 14, 15, 16, 17, 25, 26, 27. The bite was orthognathic. Name possible options for dental prosthesis constructions using implants.

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.
2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

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

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6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 18

Subject: Orthopedic treatment of patients with partial anodontia using dental implants supported by multi-units.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To teach students the methodology of orthopedic treatment for patients with partial tooth loss using dental implants supported by multi-units.

Objectives of the lesson:

1. To familiarize students with indications and contraindications for fabricating dental prostheses on dental implants supported by multi-units.
2. To acquaint students with the specifics of designing prostheses on dental implants supported by multi-units.
3. To develop practical skills in fabricating fixed dental prostheses on dental implants supported by multi-units.
4. To familiarize students with common errors and complications in the orthopedic treatment of patients with partial tooth loss using fixed dental prostheses.

Class location: the clinical setting.

Practical skills mastered during the class:

Planning of orthopedic treatment for edentulous patients using removable dental prostheses supported by dental implants with the application of cone-beam computed tomography (CBCT).

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 fully master the topic, students need to review:

- From human anatomy: the anatomical structure of the upper and lower jaws;
- From histology, cytology, embryology: morphological changes in jaw bone tissue after tooth loss;
- From general dentistry: clinical material science and laboratory techniques;
- From surgical dentistry: implant surgery.

Control questions from related disciplines:

1. Anatomy of the maxillary structure in age-related aspects and after tooth extraction.

2. Anatomy of the mandibular structure in age-related aspects and after tooth extraction.
3. Methods of radiological examination of the dentoalveolar system.
4. Alloys used in dentistry and the requirements for them.

Control questions:

1. Indications and contraindications for fabricating dental prostheses on dental implants supported by multi-units.
2. Features of designing prostheses supported by multi-units.
3. Clinical and laboratory stages of fabricating dental prostheses on dental implants supported by multi-units.
4. Advantages and disadvantages of prosthetics using multi-units.
5. Errors and complications in the orthopedic treatment of patients with partial tooth loss using fixed dental prostheses supported by dental implants with multi-units.

Note on Terminology:

"Multi-unit" can be translated from English as "multi-block," a name explained by the multifunctionality of this system and the large number of components it includes.

A multi-unit is a modern, multi-component abutment that allows attaching prosthetic structures via screw techniques. The feature of this method is that at any moment, components can be detached for balancing, replacing parts of the prosthesis, or servicing. Sometimes, such prosthetics are conditionally called removable.

Screw fixation is very reliable, much stronger than cement fixation. There are no gaps between the prosthesis and the gum; the prosthesis fits snugly, preventing the development of pathogenic flora and bacteria.

Multi-Unit abutments come in straight (for anterior teeth) and angled (tilted at 17-90 degrees to compensate for differences between the titanium rod angle and the crown).

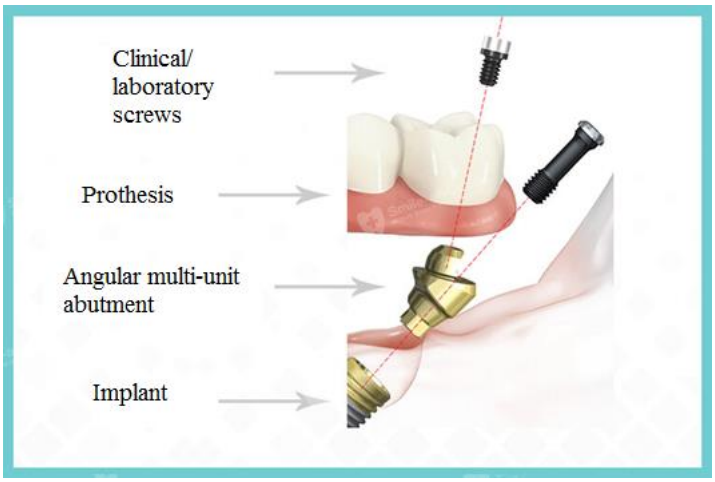

Fig. 18.1. Support via Multi-Unit

In this case, one screw securely connects the Multi-Unit abutment with the implant in the bone. The second screw fixes the prosthesis from above. A small through-hole is created in the crown through which the screw passes.

Screw fixation and some other features of Multi-Units are ideally suited for immediate load implant technologies such as ALL-on-4. During use, the complete implant-supported prosthesis can be removed in the dentist's office, thoroughly cleaned, serviced, and the condition of the implants and soft tissues underneath the prosthesis can be assessed.

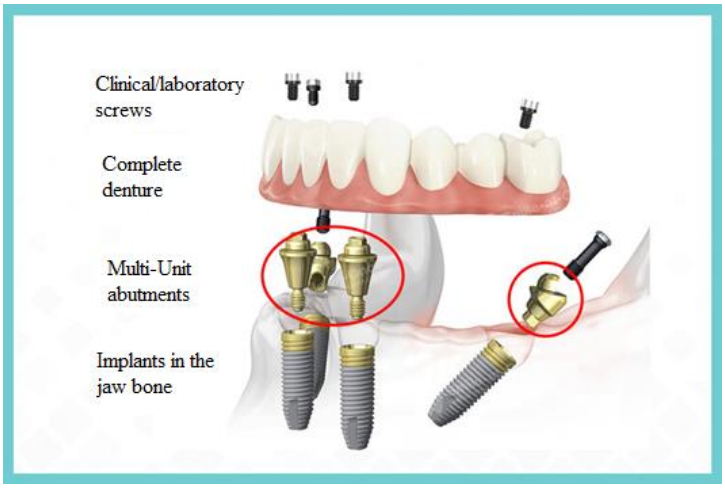

Fig. 18.2. Use of Multi-Unit abutments

Schematically, the restoration of all teeth according to the original All-on-4 Nobel Biocare protocol with the use of Multi-Unit abutments with an anodized surface Xeal looks like this.

Indications

• Single-tooth implantation;
• Prosthetics for the loss of several teeth;
• Complete edentulism;
• The need for a removable prosthesis.

Advantages of prosthetics using Multi-Units:

• Thanks to screw-retained fixation, it is easy to remove the orthopedic structure for partial or full restoration, replacement, or adjustment. When fixed with cement, removing the prosthesis without damage is impossible.

• Reliable attachment and stability, including when prosthetic procedures like All-on-4 or 6 are performed.

• Combining different types of Multi-Unit implants allows for efficient restoration procedures— for example, avoiding sinus lifts.

• While cement may develop microcracks that allow bacteria to access, the screw-retained system provides a tight fit and prevents such issues.

The only drawback of implant placement using Multi-Units is the cost — it is higher than traditional implant prosthetics.

Currently, many Multi-Unit solutions are available on the market from various manufacturers. However, essentially, they are all copies of the development by Nobel Biocare — the first Multi-Unit abutments were introduced by this company in 2000. This solution was so well-designed and convenient that it quickly became the industry standard and has been used for over 20 years.

SITUATIONAL TASKS

1. The dentist fabricated an All-on-4 prosthetic construction in the upper jaw with Multi-Units for patient B., 68 years old. The components were joined with screws using the same torque, determined with a torque wrench. Evaluate the dentist's approach. Possible complications.

2. During impression taking on implants, the dentist used A-silicone impression material. However, the impression did not meet quality standards: poor adhesion to the tray, indistinct contours of natural teeth and marginal tissues in the implant area. What could have caused the poor impression quality?

3. Patient K., 68 years old, presented complaints about chipping of the acrylic coating of an orthodontic appliance made on implants in the lower jaw. Examination revealed that a prosthesis was fabricated on the lower jaw using an All-on-6 system with Multi-Units. Orthopedic treatment was performed 1 year prior. At the time of presentation, a chip was observed in the acrylic coating near the lower incisors, along with poor hygiene, inflammation, and swelling of the mucosa near the prosthesis. All teeth in the upper jaw are preserved. Metal-ceramic crowns are on teeth 1.6, 1.5, 2.6, 2.7. The occlusion is orthognathic. How to properly examine the patient? The dentist's approach.

4. During dynamic monitoring of patient N., 47 years old, after implantation, implant mobility was detected in the area of missing tooth 37. Possible causes of implant mobility and methods of elimination.

5. Patient K., 59 years old, presented complaints of mobility of an implant-supported prosthesis in the upper jaw. Examination showed that a complete prosthesis in the upper jaw was made using an All-on-4 system with Multi-Units. Orthopedic treatment was performed 5 years prior. After fabrication, the patient did not visit the dentist for mandatory annual prophylactic maintenance. Currently, the prosthesis shows mobility, along with poor hygiene, inflammation, and swelling of the mucosa near the prosthesis. All teeth in the lower jaw are preserved. The occlusion is orthognathic. How to properly examine the patient? Possible causes of prosthesis mobility and further management.

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

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

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

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 19

Subject: Tactical, diagnostic and technological errors in orthopedic dentistry.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: To study the possible errors made at all clinical and laboratory stages of fabricating orthopedic structures.

Objectives of the lesson:

1. Learn to avoid errors when manufacturing inlays and veneers.
2. Learn to avoid errors when fabricating full-ceramic, metal-ceramic (MA), metal-ceramic (MK), and bimetallic (BM) crowns.
3. Learn to avoid errors when fabricating full-ceramic, MA, MK, BM bridge prostheses.
4. Learn to avoid errors when fabricating partial removable and clasps (hook) prostheses.
5. Learn to avoid errors when fabricating complete removable prostheses.

Class location: the clinical setting.

Practical skills mastered during the class:

Providing emergency assistance during dental appointments (fainting, shock, collapse).

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 fully master the topic, students should review:

- Human anatomy: structure of the upper and lower jaws;
- Histology, cytology, embryology: morphological changes in jawbone tissue after tooth loss;
- Materials science: clinical materials science and laboratory techniques;
- Surgical dentistry: implantation procedures.

Control questions from related disciplines:

1. Anatomy of the maxilla in the age-related context and after tooth loss.
2. Anatomy of the mandible in the age-related context and after tooth loss.
3. Methods of radiological examination of the dentoalveolar system.
4. Alloys used in dentistry and the requirements for them.

Control questions:

1. Errors in manufacturing inlays and veneers.
2. Errors in manufacturing full-ceramic, MA, MK, BM crowns.
3. Errors in manufacturing full-ceramic, MA, MK, BM bridge prostheses.
4. Errors in fabricating partial removable and clasp (hook) prostheses.
5. Errors in fabricating complete removable prostheses.
6. Errors in prosthetics supported by dental implants.

The most common errors are:

1) Incorrect assessment of the clinical condition of supporting teeth.
2) Error in choosing the number of supporting teeth.
3) Unjustified expansion of indications for bridge prostheses.
4) Violation of occlusal relationships with antagonists.
5) Breach of modeling rules for the body of the bridge prosthesis concerning the mucous membrane, supporting crowns, and the height of the chewing surface bumps.
6) Deterioration of the patient's appearance due to an unesthetic prosthesis.

- An incorrect assessment of the clinical condition of the supporting teeth is always the result of a superficial examination of the patient, during which even gross periodontal changes can be overlooked. In teeth with fillings, maintaining color and stability, the pulp may be necrotic. The seal created by a full crown can cause serious complications immediately after prosthesis placement or later. Supporting teeth with fillings should be examined radiologically and also using an electronic endodontic diagnostic device.

- An error in choosing the number of teeth is related to an incorrect evaluation of their functional capacity. Typically, this also results from insufficiently detailed clinical examination. Such mistakes lead to overloading the supporting teeth and their premature loss.

- The expansion of indications for bridge prostheses occurs when the pathogeneses of developing pathology or the nature of the interaction between the bridge prosthesis and the tissues of the prosthetic bed (which is the periodontium in this case) are not considered. A common mistake, when the pathogenetics of the developing pathology is not taken into account, is prosthetic treatment of bilateral embedded defects of the lateral teeth sections with a deep, reducing occlusion. In this type of bite, as is well known, cutting-bump contacts of the anterior teeth are absent. After losing part of the lateral teeth, the remaining molars and premolars become overloaded and shift vertically. This is followed by a decrease in the alveolar height, with the deep bite becoming traumatic. Prosthetic treatment with bridge prostheses using the remaining lateral teeth as support increases their functional overload. The developing primary traumatic syndrome promotes further reduction of the bite height. The mistake here is that, instead of preventing further lowering of the bite height, bridge prosthetics create conditions for the progression of the pathological mechanism.

- An increase in bite height on bridge prostheses is a gross mistake that is easy to notice. Another mistake involves disrupting contacts between artificial teeth and their natural antagonists (whether full or partial). The functional efficiency of such prostheses is low.

- Errors in modeling the body of the bridge prosthesis include creating overly prominent chewing bumps, a large contact area with the alveolar process mucosa, and insufficient bonding area between the prosthesis body and crowns, often leading to detachment of the prosthesis body and damage to the mucosa. Essentially, these are technical errors. They include poor bonding of prosthesis parts, substandard casting (castings), which may cause the prosthesis to break. A serious error is deformation of the prosthesis during bonding. In this case, the prosthesis cannot be properly placed on the supporting teeth: it balances improperly or the artificial teeth do not articulate with their antagonists. Speaking of technical errors, thinning of crowns after careless bleaching or polishing is also considered a mistake. Metal in such crowns wears out quickly. Areas of exposed tooth tissue appear on the bumps of chewing teeth or cutting edges of incisors. A prosthesis with

crown defects should be removed. Crowns are cut with a wheel-shaped bur No. 5 or special pliers. To protect the gum margin from damage, a metal spatula is applied, the edges of the crowns near the cut are bent outward, and then the prosthesis is easily removed with a crown remover.

Assessment of the quality of bridge prosthesis fabrication

Assessment of the Quality of a Bridge Prosthesis	1. Quality of the fabrication of supporting crowns (absence of defects, anatomical shape, parallel placement of all supporting crowns). 2. Correct modeling of the intermediate part. 3. Quality of casting the intermediate part. 4. Quality of soldering the intermediate part with the supporting elements of the prosthesis. 5. Quality of the veneer. 6. Quality of finishing and polishing of the prosthesis.
Checking the construction of a bridge prosthesis	1. The prosthesis should fit onto the supporting teeth. 2. Supporting crowns should tightly encase the necks of the supporting teeth. 3. The prosthesis should not interfere with occlusion in all types of bite.
Requirements for the intermediate part of a bridge prosthesis	1. Should contact the mucosa of the alveolar process in the anterior region or have a washout space in the lateral regions. 2. Should not have sharply defined cusps on the chewing teeth. 3. Should not have sharp angles. 4. Must have a smooth, polished surface. 5. Must be firmly connected to the supporting crowns

Checking the design of a monolithic metal framework of a bridge prosthesis:

The inspection of a monolithic metal framework in a clinic should begin with a visual assessment of casting quality and processing by the dental technician. The framework should not have pores, overflows, defects, undercuts; it should easily fit onto the plaster model and be removable from it.

After inspection, the metal framework is tried on the patient's supporting teeth. The framework should fit freely without tension and should reach the surgeon-defined level from all sides (buccal, lingual, mesial, distal), i.e., to the gum or mid-gum groove.

If the supporting crown(s) does not reach the required level (ledge) in any area or if the framework is unbalanced, check whether the framework is properly seated on the supporting teeth. This can be done visually, with copying paper, or with a small amount of corrective impression material. In areas preventing proper seating of the crowns, the material will be indented. This method reveals deficiencies in tooth preparation or casting inaccuracies.

Additionally, examine the mucous membrane of the gum: pallor indicates elongated borders.

If the framework will be veneered with ceramic or plastic, determine the interocclusal distance between the framework and the opposing teeth; it should match the thickness of the porcelain veneer (1.2 mm). If the prosthesis is unveneered, verify occlusal contacts. Also, clarify the relationship between the metal intermediate part of the prosthesis and the mucous membrane of the alveolar process. There should be a 1.5–2 mm gap between them.

At this clinical stage, determine the color of the ceramic veneer under natural lighting. It is advisable to do this together with the dental technician and considering the patient's preferences.

Checking the construction of a metal framework with ceramic veneer

When fitting a monolithic framework with ceramic veneer, attention should be paid to:

- The unobstructed placement of the prosthesis onto the supporting teeth;

- The aesthetic qualities of the prosthesis (color of the porcelain veneer, shape of crowns and facets);

- The accuracy of crown margins at the cervical zone;

- The relationship of the intermediate (body) part of the bridge prosthesis with the underlying mucous membrane of the jaw's alveolar process;

- The occlusal relationships of the prosthesis with antagonists in central, anterior, and transverse occlusions, as well as during all phases of dental articulation.

Errors in the fabrication of stamped and soldered bridge prostheses identified during the construction check

Errors	Causes	Methods of Elimination
Prostheses do not fit onto the supporting teeth.	1. Improper preparation of the supporting teeth. 2. Displacement of supporting crowns in the impression. 3. Displacement of prosthetic elements during soldering.	1. Re-preparation of supporting teeth. 2. Soldering the prosthesis, fitting the supporting crowns, taking a new impression, adjusting the intermediate part, and soldering.
The supporting crown does not fit snugly to the tooth neck.	The crown was improperly fabricated.	Soldering the prosthesis, making a new crown, taking an impression with the prosthetic details, and soldering.
The prosthesis increases the occlusion on the supporting crowns.	Under-prepared teeth. Improperly fitted crowns.	Re-preparing the supporting teeth, manufacturing new crowns, fitting them, taking impressions, adjusting the prosthetic body, and soldering the prosthetic components.
The prosthesis increases the occlusion on the intermediate part.	The intermediate part of the prosthesis was modeled with an overestimate.	Use copying paper to identify areas preventing mandibular movement, then grind these areas with vulcanite wheels.

SITUATIONAL TASKS

1. Patient K. presented with complaints about frequent loosening of a full-coverage prosthesis supported on teeth 45 and 47. What reasons might lead to this complication?

2. When determining the height of a metal-ceramic artificial prosthesis in the molar region, a significant overclosure was found during central occlusion. What is your approach?

3. During examination of a metal-ceramic bridge prosthesis supported on teeth 12 and 14, an inconsistency in the anatomical shape of the teeth was observed. What is the clinician's course of action?

4. During inspection, a mismatch in the color of the metal-ceramic bridge construction compared to natural teeth was found. What is the mistake? What is your approach?

5. When measuring the height of a metal-ceramic artificial prosthesis in the molar region, over-occlusion was detected during central occlusion. What is your approach?

6. Patient P. reported mobility of a metal-ceramic bridge supported on teeth 12 and 22, installed the day before. What reasons might lead to this complication?

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners' Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.

2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

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

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

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

6. https://etest.bsmu.by/course/view.php?id=498.

LESSON 20

Subject: Organizational foundations of dental orthopedic care.

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	**58**
6.	Final stage	**13**

Purpose of the lesson: to study the organizational foundations of dental prosthetic care, issues of deontology, asepsis, and antisepsis in an orthopedic dentistry clinic, medical errors, and the professional responsibility of a dental prosthodontist.

Objectives of the lesson:

1. To study the organizational foundations of dental prosthetic assistance.
2. To examine issues of deontology, asepsis, and antisepsis in an orthopedic dentistry clinic.
3. To learn about medical errors and the professional responsibility of a dentist-prosthodontist.

Class location: the clinical setting.

Practical skills mastered during the class:

- Hygienic hand processing.

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 fully master the material, students need to review:

- Asepsis and antisepsis in medical practice;
- Medical ethics;
- Understanding of deontology.

Control questions from related disciplines:

Main legal frameworks:

- Law "On Healthcare" of the Republic of Belarus (RB),
- Provisions on medical expertise in RB,
- Sanitary norms and regulations of RB,
- Orders of the Ministry of Health of RB.

Control questions:

1. The organizational foundations of dental prosthetic care in the Republic of Belarus.
2. Structure of a dental polyclinic and orthopedic department.
3. Rights and responsibilities of the doctor and patient.
4. Service life and quality guarantees of dental prostheses.
5. Issues of medical ethics, deontology, asepsis, and antisepsis in an orthopedic dentistry clinic.

ORGANIZATION OF DENTAL CARE FOR THE POPULATION OF THE CITY AND DISTRICT

The dental service in our country is planned, organized, directed, and controlled by the Ministry of Health of the Republic of Belarus (RB).

At all levels of health management administration, the Chief Dental Specialist is appointed, usually on a voluntary basis, and within the paid staff of this health department, there is a specialist who oversees dental issues.

In large administrative areas, these specialists focus solely on organizing the dental service (they are dentists by education), while in smaller areas, they oversee several medical specialties and are most often not dentists by training.

Chief dental specialists are appointed from among the most qualified dentists—professors, associate professors, and research staff working in dentistry who are well-versed in the organization of the dental service.

In cities without universities or research institutes, the chief dentist is typically appointed as the head doctor of the regional or city dental polyclinic, and the chief dentist of the district health department is the head doctor of the district dental polyclinic.

Dental assistance to urban populations is provided in healthcare and preventive institutions of the Ministry of Health of RB and in healthcare institutions of various departments. These include:

– Dental clinics;

– Dental departments within territorial (multidisciplinary) clinics, medical and sanitary units of enterprises and agencies;

– Dental offices in hospitals, dispensaries, women's consulting clinics, preschools, higher and secondary educational institutions, and on medical health points of enterprises and departments, etc.

A certain portion of city residents receive dental care at republican and regional (territorial) dental clinics and departments housed under central district hospitals located in the cities.

Special importance in the urban dental service structure is given to dental clinics.

The guiding document for forming the staffing schedule of dental clinics in cities with a population over 25,000 is the order of the Ministry of Health of RB dated April 19, 2006, No. 23 "On Staffing Norms for Medical Personnel of Dental Clinics."

According to this order, the positions of prosthodontist dentists supported by extrabudgetary funds are established at a rate of 0.135 positions per 1,000 adult residents of the region (Minsk).

The head of the prosthetic department is appointed at a rate of 1.0 position per clinic, which, according to these staffing standards, has 4 or more dentists-prosthodontists, replacing one of them with an extrabudgetary position.

The position of medical nurse for the dental prosthetic office is established at a rate of 1.0 position per 1.5 dentists-prosthodontists (supported by extrabudgetary funds).

Positions of dental technicians in the dental laboratory are established depending on the volume of work, determined according to current time standards for dental prosthetic work (supported by extrabudgetary funds).

Positions of medical registrars are established in prosthetic departments at a rate of 1.0 position for every 5 dentists-prosthodontists (supported by extrabudgetary funds).

The senior dental technician in the dental laboratory is appointed for every 10 dental technicians, but at least 1 position, supported by extrabudgetary funds.

The head of the dental laboratory (laboratory production manager) is appointed in each clinic (supported by extrabudgetary funds).

The position of senior nurse in the prosthetic department is established corresponding to the head of the department, instead of a nurse position (supported by extrabudgetary funds).

The position of orderlies is established at a rate of 1.0 unit per:

– 2.5 dentists-prosthodontists (supported by extrabudgetary funds);

– 20 dental technicians (supported by extrabudgetary funds).

Structure of the dental polyclinic:

1. Chief medical officer.
2. Deputy chief medical officer for clinical and consultative work.
3. Organizational and methodological department.
4. Department of dental disease prevention.
5. Department of therapeutic dentistry.
6. Second department of therapeutic dentistry (for the treatment of periodontal and mucosal diseases).
7. Department (office) of surgical dentistry.
8. Department of orthopedic dentistry with a dental laboratory.
9. Physiotherapy office.
10. X-ray room.
11. Registration desk.
12. Administrative and household department.
13. Accounting department (in the absence of a centralized accounting service).

The chief dentist of the polyclinic reports to the head of the health department (district, city, or region). He/she oversees all therapeutic, organizational, administrative, economic, and financial activities of the polyclinic.

The deputy chief medical officer organizes the work of departments in accordance with the regulations governing the dental polyclinic, orders, and instructions from healthcare authorities, and is guided in his/her activities by current legal statutes, as well as directives and instructions from higher organizations. He/she develops and implements measures to provide the population of the district with qualified polyclinic assistance in line with the modern level of medical science and technology.

Departments of therapeutic, surgical, and orthopedic dentistry are headed by respective department heads.

The orthopedic department is led by a department head who is a dentist-orthopedist, reporting to the chief doctor and his/her deputy for clinical work. This head directly manages the department's activities, the medical staff subordinate to him/her, and bears full responsibility for the quality and professionalism of medical services and adherence to deontological standards.

The department head:

– Provides qualification and consultative assistance in orthopedic dentistry;

– Ensures timely implementation of treatment plans by dentist-orthopedists;

– Properly maintains all medical documentation;

– Systematically monitors the work of department doctors, ensures quality orthopedic care for patients, and accurately maintains medical histories and other medical records;

– Oversees the educational process for interns and the professional development of city and regional doctors;

– Conducts safety and fire prevention training for staff.

The department head is obliged to:

– Prepare a work schedule for department staff and coordinate it with the chief doctor or his/her deputy;

– Ensure timely examination and treatment of patients in accordance with current medical standards;

– Organize appropriate staffing and labor organization, as well as conduct professional development activities for medical and mid-level personnel;

– Monitor the rational use of equipment, devices, and tools;

– Conduct quality analyses of the work of department doctors;

– Ensure proper storage of potent substances and flammable materials;

– Implement modern orthopedic treatment methods in the department;

– Discuss errors made by doctors in orthopedic care during medical conferences;

– Check the accuracy of medical histories and work orders maintained by doctors;

– Monitor staff compliance with safety and fire prevention rules;

– Oversee the implementation and quality of planned sanitary-educational work carried out by department doctors.

The department head acts as the primary specialist consultant in his/her field within the polyclinic. When necessary, he/she consults with patients through department heads or convenes a consultative board, being personally present at the meetings. The department head must plan his/her workday so as to have time for patient reception and department management.

He/she recommends employees for commendation, and in cases of violations of labor discipline or deontological rules, reports his/her proposals to the chief doctor or his/her deputy for clinical work for appropriate administrative action.

The head of the department bears administrative responsibility:

– For the untimely and substandard provision of orthopedic assistance;

– For employees of the department not complying with labor discipline and deontological rules;

– For disruptions in the educational process of intern doctors and training sessions for city and regional doctors due to department staff's fault;

– For failure to fulfill their functional duties.

The dentist-orthopedist is appointed by the chief physician of the polyclinic. In their work, they report to the head of the department, the deputy chief physician, and the chief physician. The dentist-orthopedist’s orders are mandatory for mid-level and junior staff within the scope of their functional responsibilities, specific to this department (office).

The task of the dentist-orthopedist is to provide quality therapeutic care to the population. The dentist-orthopedist is obliged to:

– Accept patients according to the schedule approved by the head of the department, at the time specified in the ticket;

– Ensure orthopedic treatment in accordance with modern standards;

– Strive to minimize the manufacturing time for dental prostheses, fulfilling all planned and unplanned production indicators;

– Manufacture removable and non-removable prostheses strictly in accordance with clinical indications;

– When prosthetizing the anterior teeth, aim for 100% production of aesthetic prostheses;

– Use effective pain relief methods during the treatment of vital teeth as indicated;

– Avoid producing non-removable prostheses from different metals for the same patient;

– Not exceed the production time: more than 3 weeks for individual removable and non-removable prostheses, and more than 1 month for hybrid prostheses;

– Accept patients with properly prepared and paid orders;

– Improve their qualifications;

– Conduct health education and sanitary awareness work among the population;

– Follow safety rules and fire prevention measures at their workplace.

The dentist-orthopedist bears administrative responsibility:

– For not fulfilling the production plan and providing poor-quality treatment;

– For breach of labor discipline and deontological rules;

– For improper maintenance of accounting and reporting documentation;

– For incorrect preparation of the oral cavity for prosthetics;

– For incorrect selection of prosthesis design;

– For violations of safety and fire prevention rules.

The main documents for medical reporting in the work of the dentist-orthopedist are:

– Dental outpatient card, form № 043/u-10;

– Daily record sheet of the dentist's work, № 037/u-10;

– Daily record of therapeutic and preventive work of the dentist, form № 039/u-10.

The quality assessment of fabricated removable and fixed dental prostheses is conducted in accordance with the general technical requirements for dental prostheses, approved by the Ministry of Health of the Republic of Belarus, order № 394 dated 23.04.2009.

Deontological issues in the theory and practice of medicine are of great importance for both scientific workers and practicing physicians.

The term "deontology" originates from the Greek word "deon", meaning duty. Literally, deontology is "the science of duty." The term was first introduced by the English philosopher and jurist J. Bentham in 1834. In domestic medicine, deontology was introduced by Professor N.N. Petrov in 1939. Russian medical professionals view deontology as a set of ethical principles aimed at maximizing treatment effectiveness, as well as a science about the moral, aesthetic, and intellectual image that medical practitioners should have, the nature of relationships between doctors, patients, and their relatives (close ones), and how relations within the medical team should be structured.

Throughout history from Hippocrates to the present day the issue of doctor-patient relationships has been complex and relevant. The nature of these relationships has changed in different eras.

In the work of each medical professional, two aspects are crucial: scientific knowledge and its practical application, i.e., the theoretical and practical dimensions.

Theoretically, deontology studies factors that positively or negatively influence the development, progression, and outcome of diseases; practically, it encompasses a set of rules for doctor behavior during patient interactions and the clear organization of diagnostic and therapeutic work. Dentistry, as a branch of medicine, adheres to the general requirements of medical deontology. At the same time, the specific nature of dentistry determines the unique recommendations of deontology in hospital and outpatient clinic settings, as well as in different departments within the clinic—such as therapeutic, surgical, orthopedic, pediatric, etc.

Organizational factors in the orthopedic department of a dental clinic manifest through the schedule of doctor appointments and the work of auxiliary services involved in patient reception. Well-organized information on common issues that concern patients plays an important role here for example, the working hours of doctors, prosthesis manufacturing timelines, prices, priority assistance rules, etc. Such information helps reduce patients' waiting times, minimizes questions they ask to the medical staff, and contributes to adhering to the schedule, creating a positive psychological atmosphere.

It is advisable to preliminarily visually assess waiting patients to identify anxious or agitated individuals – people whose behavior could negatively affect the mental state of others. In such cases, it's necessary to draw their attention, showing understanding and sympathy, so they realize the doctor empathizes with and understands their condition and is willing to help. This usually calms patients. During the appointment, attention should also be paid to conversations taking place in the office. Maintaining a calm, professional, and composed tone, and avoiding unrelated topics, fosters respect for the staff and creates an atmosphere of trust.

At this stage, the doctor's authority begins to form, which is not only determined by professional knowledge and skills but also by tactfulness, manner of communication with patients and staff, appearance, and behavior. The art of communicating effectively with patients, their relatives, or loved ones depends on the doctor's abilities, acquired experience, and willingness to master this art. It is important to learn how to ask appropriate questions, respond thoughtfully, listen patiently to the patient's reasoning, and gather information necessary not only for accurate dental diagnosis but also to assess the patient's psychological state.

Patients often dwell on questions unrelated to the actual health issue. The doctor must steer the conversation gently and tactfully in the right direction.

Oral manipulations should begin with simpler interventions and gradually move to more complex procedures. This should be done slowly, without haste, remembering that every hand movement of the dentist and their facial expression are visually perceived by the patient, psychologically processed, and can provoke corresponding behavioral responses.

During contact with a patient, a doctor must observe ethics toward the doctor who previously treated them, regardless of circumstances. Unfortunately, critical remarks are sometimes heard particularly regarding the quality of existing prostheses. Such comments do not enhance the doctor's authority in the eyes of the patient and can undermine their trust in medical professionals altogether, possibly leading the patient to lose faith in the possibility of recovery.

If a mistake has been made by a previous colleague, it is advisable to tactfully explain to the patient that their condition of the maxillofacial system indeed causes significant difficulties in prosthetics, and to avoid failure, it is necessary to apply a different method of prosthetics. In other words, it is best to refrain from giving a specific assessment of the work previously performed, in order not to discredit the treating specialist in the eyes of the patient. Such a tactic by the doctor in subsequent treatment is more beneficial than negative reviews of colleagues' work.

The very fact of collegial review of a doctor's errors and benevolent, principled criticism are among the methods of deontological and professional improvement.

An important element of a dentist's deontology is the use of special medicinal agents to prevent undesirable mental reactions in patients. For this purpose, premedication and anesthesia are used not only in surgical dentistry but also in the practice of therapists and prosthodontists. Currently, it is within our power to eliminate both pain and the fear of it during any procedures; only shortcomings in organization, adherence to outdated methods, and sometimes even the complacency toward routine pain during dental visits hinder the widespread implementation of anesthesia in dental practice.

Necessary components of the work of a prosthodontist include diagnosis, treatment planning, prosthesis design, and selection of essential materials. This process involves reflection, doubts, and comparisons. Sometimes, doctors verbalize their reasoning aloud at the patient's chair, proposing various treatment options. The dentist appears to consult with the patient, inviting them to participate in choosing the prosthesis design and to share responsibility for the outcome. Practice

shows that this manner of communication often causes confusion and uncertainty in the patient. It is more appropriate for these considerations to be made privately, away from the patient. The dentist should confidently communicate the final treatment plan, leaving no room for doubt.

When choosing a treatment plan, mutual consultations among a therapist, surgeon, and prosthodontist may sometimes be necessary. This involves determining the scope of treatment, detailing the clinical tactics, and may include conflicting opinions. Such discussions should not take place in the presence of the patient.

When selecting the design of a prosthesis or appliance, it is essential to consider not only the condition of the oral cavity but also the patient's personality traits, overall health, professional activity, age, and pay special attention to any mental health issues or serious diseases of other organs or systems. For such patients, a consultation among specialists or a medical commission is necessary, which should not only decide on a treatment plan but also psychologically establish a foundation for the patient's full confidence in the correctness and necessity of the proposed treatment.

When explaining the design of a future prosthesis or appliance to the patient, it is advisable to show them similar prostheses intended for other patients. This helps the patient better visualize the prosthesis and avoids many misunderstandings. Special attention should be paid to indications and contraindications for removable and fixed prostheses.

When handing over a removable prosthesis to a patient, it is important to explain how to use it, teach them how to insert and remove it, and warn about possible pain sensations. A follow-up appointment should be scheduled for prosthesis correction.

An important feature of a prosthodontist's work, setting them apart not only from doctors of other medical specialties but also from specialized professionals, is that prosthetic treatment involves collaboration with another specialist – the dental technician. The technician's professional qualification and conscientiousness largely determine not only the success of prosthetics but also the patient's satisfaction. This creates certain challenges for the doctor, particularly the need to establish additional professional contacts with the technician. Therefore, we find it appropriate to supplement the well-known general medical deontological principle "doctor–device–patient" with the link "dental technician." Such an addition would better reflect the particular deontological features necessary for treating prosthetic patients and underscore the importance of the prosthodontist's adherence to these principles in daily practical work.

From our point of view, the prosthodontist, in relation to the technician, should act as: a) a leader and organizer of the treatment process; b) a mentor; c) a specialist. The dental technician must strictly adhere to the prosthesis manufacturing technology and complete the work within the designated timeframe prescribed by the doctor. After producing the prosthesis, they should present it for technical inspection to the head of production (senior technician) and then to the doctor. If there are doubts about the correctness of the design or the execution of certain manipulations during fabrication, the technician should consult the doctor for clarification.

During prosthesis production, the technician should use materials economically, keep the workspace clean, and strictly follow the work schedule. During work, they should avoid loud conversations on unrelated topics, as this distracts nearby colleagues and may affect the quality of the prostheses. They must also strictly observe safety and fire safety rules.

In cases of poor-quality impressions or other defects caused by the doctor, the technician returns the work for redoing the procedure, ensuring all requirements are met.

Similarly to the prosthodontist, the dental technician should not discuss the correctness of the prosthesis design or manufacturing technology in the presence of the patient. Any questions on these issues should be resolved collegially in the prosthetic office or dental laboratory, without the patient.

In some cases, when a less experienced technician lacks the manual skills for a particular stage of prosthesis fabrication, the prosthodontist, as a specialist and mentor, may perform that stage themselves at the technician's workstation, demonstrating the technique and rules visually, thereby enhancing the technician's professional skills.

Relations within the team among doctors, dental technicians, nurses, and sanitary workers also play a significant role in deontology. “The success of medical work requires coordinated actions of all involved participants, which is essential to maximize the benefit of the physicians,” wrote the founder of Russian deontology, N.N. Petrov. Respect and understanding of the importance of the work performed by junior and mid-level staff should be expressed through mutual trust and fairness. As Professor B.A. Korolyov notes, managers of clinics, departments, or laboratories should set a personal example rather than serve solely as “spiritual” mentors. Loud or arrogant behavior from some administrators can spread throughout the team, causing tension and distrust. Relationships within the team should be built on mutual respect.

Every doctor, including a dentist, should not only uplift the patient with kind words and responsiveness but also improve their mood and instill optimism and hope through their appearance. A.P. Chekhov wrote: “The profession of a doctor is a feat; it demands self-denial, purity of soul, and purity of thought. One must be clear-minded, morally pure, and physically neat.”

LITERATURE

Basic:

1. Removable Partial Dentures. A Practitioners’ Manual / Editor Olcay Şakar. - 2nd Edition. – Springer, 2024. – 423 p.
2. Waliszewski, Michael P. Brudvik's Advanced Removable Partial Dentures. Book of Prosthodontics. – 2nd Edition. – UK : Quintessence Publishing, 2022. – 203 p.

Additional:

3. Complete dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^{d} ed. – Minsk : BSMU, 2018. – 32 p.
4. Fixed dentures. Algorithm of producing. / S. A. Naumovich [et al.]. – 3^{d} ed.– Minsk : BSMU, 2018. – 30 p.
5. 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»

6. https://etest.bsmu.by/course/view.php?id=498.

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