Ministry of HealthCare of the Republic of Belarus
BELARUS STATE MEDICAL UNIVERSITY

Department of Prosthetic Dentistry and Orthodontics

NON-REMOVABLE PROSTHETICS

Methodology texts for Practical Training of Students
3-d year, 5-th semester

BSMU, Minsk 2023

APPROVED by

Associate professor A.S.Barunou
Acting Head of the Dpt., Ph.D.

_____

Protocol of the Methodical
Meeting of the Department № 1
August 30, 2023

Thematic Plan of Practical Training in the academic discipline «Non-removable prosthetics» for 5th semester, 3rd year students

1. Preparation of the oral cavity for prosthetics. Methods of anesthesia in the preparation of teeth.

The choice of drug and method of anesthesia.

2. Defects of hard tissues of teeth. Methods of examination of patients with defects in hard dental tissues. Dental photo protocol when planning prosthetic treatment of patients with defects in dental crowns.

Patient examination. Completion of medical documentation.

3. Working and auxiliary impressions and modern materials for their taking. Steps for taking an impression. Getting a digital impression. Laboratory scanning of models.

Taking impressions with alginate and silicone materials.

4. Inlays, indications for use. Modern construction materials and methods for manufacturing inlays.

Determining the tactics of treating patients using inlays.

5. Features of the formation of cavities for inlays, depending on the topography and the size of the defect. Clinical and laboratory stages of making inlays by direct and indirect methods.

Preparation of cavities for inlays on gypsum.

6. Veneers, indications for use. Characteristics of modern construction materials. Methods for making veneers.

Modeling of veneers on plaster models.

7. Tooth preparation and clinical and laboratory stages of veneers manufacturing. Modern materials and fixation methods of veneers.

Preparation of cavities for veneers on plaster models.

8. Metal stamped crowns. Clinical and laboratory stages of manufacturing.

Examination of the patient, determination of indications for the manufacture of metal stamped crowns.

9. Acrylic crowns. Clinical and laboratory stages of manufacturing.

Examination of the patient, determination of indications for the manufacture of acrylic crowns.

10. Combined crowns, clinical and laboratory stages of manufacturing.

Examination of the patient, determination of indications for the manufacture of combined crowns.

11. Clinical and laboratory stages of manufacturing cast-metal, metal-acrylic, metal-ceramic crowns. Specific features of the preparation of teeth and taking impressions. Method of fitting, sitting and fixation of single crowns.

Examination of the patient, determination of indications for the manufacture of cast, metal-acrylic, metal-ceramic crowns.

12. Non-metal crowns. Characteristics of modern construction materials. Methods for manufacturing metal-free crowns (milling, sintering, pressing).

Examination of the patient, determination of indications for the manufacture of metal-free crowns.

13. Features of tooth preparation for the manufacture of metal-free crowns. impression materials. Methods for making impressions. Clinical and laboratory stages of manufacturing.

Making impressions from alginate and silicone materials. Post structures. Indications for use. Requirements for the condition of the root and its surrounding tissues.

14. Restorative post constructions. Indications for use. Requirements for the condition of the root and its surrounding tissues.

Examination of the patient, determination of indications for the manufacture of various post constructions.

15. Clinical and laboratory stages of manufacturing restorative postconstructions.

Selection of a treatment plan for patients with a complete absence of a tooth crown with post constructions.

16. Prosthetic treatment of patients in the absence of a tooth crown with stump root inlays, indications for use. Clinical and laboratory stages of manufacturing stump root inlay structures. Fiberglass posts.

Selection of a treatment plan. Selection of materials for fixation of fiberglass posts, taking impressions with alginate and silicone materials.

Thematic Plan of Lectures

5th semester, 3rd year students in the academic discipline
«Non-removable prosthetics» (10 lectures, 14 hours)

1. Aims, objectives of the discipline "Non-removable prosthetics". Principles of medical ethics and deontology. The main nosological forms of pathology of the dental system
2. Pathology of hard tissues of teeth of carious and non-carious origin. Prosthetic treatment planning.
3. Inlays. Modern construction materials and methods for manufacturing inlays. Inlays, indications for use. Modern construction materials and methods for manufacturing inlays. Determining the tactics of treating patients using inlays
4. Veneers. Modern construction materials and methods for the manufacture of veneers
5. Metal stamped, acrylic, combined crowns. Indications for use
6. Clinical and laboratory stages of making stamped metal, plastic, combined crowns. Construction materials
7. Cast-metal, metal-acrylic, metal-ceramic crowns. The reaction of tooth and periodontal tissues to preparation. Security zones by Abolmasov-Klyuev
8. Non-metal crowns. Characteristics of modern construction materials.
9. Classification of restorative post constructions.
10. Clinical and laboratory stages of manufacturing restorative post constructions. Modern construction materials.

Lectures - 10 (14 hours)
Practical lessons - 80 hours
Number of weeks - 16
Total training hours - 94 hours

BELARUS STATE MEDICAL UNIVERSITY, DENTAL FACULTY

EXAMINATIONAL SHEET

PRACTICAL SKILLS NON-REMOVABLE PROSTHETICS DENTISTRY,

YEAR **3** SEMESTER **5** GROUP ☐☐ _____Student

_____

Teacher Members of examinational group Date

Practical skills	Point	realization ("Yes", "No")		Examination group	Point
		Student	Teacher		
1.Examination of patient:					
1.1 Perquisition	2				
1.2 Estimation of facial signs	2				
1.3 Examination of mouth cavity, instrumental examination	3				
1.4 Determining of Milikevich index	2				
1.5. Determining of masticatory effectiveness by Agapov	2				
2. To determine indications for:					
2.1 Sanation of mouth cavity	2				
2.2 Special surgical measures	2				
3.Putting a diagnosis:					
3.1 Hard tissues defects	2				
3.2 Partial tooth loss	3				
4.Treatment using:					
4.1 Inlays	3				
4.2 Artificial crowns:					
4.2.1 Cast metal	2				
4.2.2 Plastic	3				
4.2.3 Combined	3				
4.3 Pins constructions	4				
4.4 Partial fixed dentures	5				
5.Making of anaesthesia	3				
6.Stages of treatment:					
6.1 Preparing of cavity for inlay	5				
6.2 Modeling of inlay directly					
6.2.1 Reconstructive	4				
6.2.2 Cast pins	5				
6.3 Preparing for crowns:					
6.3.1 Cast metal	5				
6.3.2 Plastic	5				
6.3.3 Combined	5				
6.4 Taking of impression					
6.4.2 Alginate	4				
6.4.3 Silicone	5				
6.5 Casting of models	5				
6.6 Determining and fixation of central occlusion	2				
6.7 Fitting fixed dentures	5				
6.8 Cementation of fixed dentures	5				
7.Medical documentation	2				

POINTS ☐ **MARK** ☐ ☐

Comment: _____

Signs: _____

APPROVED by

Associate professor A.S.Barunou
Acting Head of the Dpt., Ph.D.

Protocol of the Methodical
Meeting of the Department № 1
August 30, 2023

Assessment criteria of learning outcomes (grade descriptors)

Grade "10" (ten)

is given to the students who show comprehensive systematic and in-depth knowledge in all areas of the curriculum, as well as on the main issues that go beyond its borders, are fluent in the basic concepts of the Non-removable Prosthetics discipline course, display evidence of extensive background reading of relevant and additional literature recommended by the curriculum, can communicate the material stylistically correctly and in a highly-structured way. The student must demonstrate the ability to independently and creatively solve complex problems, critically evaluate and analyze the theories and concepts in the areas of Non-removable Prosthetics discipline and apply the knowledge of other disciplines to the task set. The student must actively participate in group discussions and show a high level of culture while undertaking the tasks.

Grade "9" (nine)

is given to the students who show deep and systematic knowledge in all areas of the curriculum, are fluent in the basic concepts of the Non-removable Prosthetics discipline, display evidence of extensive background reading of relevant literature and are familiar with the additional resources, can present the material stylistically correctly and logically coherently. The student must demonstrate the ability to independently and creatively solve complex problems within the framework of the curriculum, feel confident in the basic theories and concepts of Non-removable Prosthetics discipline and give them critical evaluation. The student must actively participate in group discussions and show a high level of culture while undertaking the tasks.

Grade "8" (eight)

is given to the students who show deep and systematic knowledge on the identified issues within the scope of the curriculum, are fluent in the basic concepts of the Non-removable Prosthetics discipline, display evidence of extensive background reading of relevant literature and are familiar with the additional resources, recommended by the curriculum, can present the material stylistically correctly and logically coherently. The student must demonstrate the ability to independently solve complex problems within the framework of the curriculum and feel confident in the basic theories and concepts of Non-removable Prosthetics discipline. The student must actively participate in group discussions and show a high level of culture while undertaking the tasks.

Grade "7" (seven)

is given to the students who show full and deep knowledge in all areas of the curriculum, have a good command of the basic concepts of the Non-removable Prosthetics discipline, display evidence of extensive background reading of relevant literature and are familiar with the additional resources, recommended by the curriculum, can present the material stylistically correctly and logically coherently. The student must demonstrate systematic knowledge of Non-removable Prosthetics discipline, show the ability to independently solve complex problems and feel confident in the basic theories and concepts of Non-removable Prosthetics discipline. The student must actively participate in group discussions, show a high level of culture while undertaking the tasks.

Grade "6" (six)
is given to the students who show sufficiently complete knowledge within the scope of the curriculum, have a good command of the basic concepts of the Non-removable Prosthetics discipline, can communicate the material amply, are able to make informed judgments, display evidence of background reading of the relevant literature recommended by the curriculum. The student must demonstrate systematic knowledge of Non-removable Prosthetics discipline, show the ability to independently apply the standard solutions within the framework of the curriculum, feel confident in the basic theories and concepts of Non-removable Prosthetics discipline and give them a comparative assessment. The student should periodically participate in group discussions, show a high level of culture while undertaking the tasks.

Grade "5" (five)
is given to the students who show sufficient knowledge within the scope of the curriculum, have a good command of the basic concepts of the Non-removable Prosthetics discipline, can stylistically competently communicate the material on the identified issues, are able to make informed judgments, display evidence of background reading of the relevant literature recommended by the curriculum. The student must demonstrate the ability to independently apply the standard solutions within the framework of the curriculum, feel confident in the basic theories and concepts of Non-removable Prosthetics discipline and give them a comparative assessment. The student must participate in group discussions, work independently in practical classes, show a high level of culture while undertaking the tasks.

Grade "4" (four) – acceptable (passed)
is given to the students who show sufficient knowledge within the educational standard, have a good command of the basic concepts of the Non-removable Prosthetics discipline, use scientific terminology, can stylistically correctly and logically appropriately communicate the material, are able to draw conclusions without significant errors, display evidence of background reading of the relevant literature recommended by the curriculum. The student must demonstrate the ability to solve standard problems under the supervision of a teacher, feel confident in the basic theories and concepts of Non-removable Prosthetics discipline and be able to evaluate them. The student must work in practical classes under the guidance of a teacher, demonstrate acceptable level of culture while undertaking the tasks.

Grade "3" (three) – unacceptable (failed)
is given to the students who show insufficiently full scope of knowledge within the educational standard, have a low level of command of the basic concepts of the Non-removable Prosthetics discipline, communicate the material on the identified issue with significant linguistic and logical errors, are incompetent in solving standard problems, show little evidence of background reading of the relevant literature recommended by the curriculum, are not familiar with the basic theories and concepts of Non-removable Prosthetics discipline, are passive in practical classes, show a low level of culture while undertaking the tasks.

Grade "2" (two) – unacceptable (failed)
is given to the students who show fragmentary knowledge within the educational standard, communicate the material with serious stylistic and logical errors, display little knowledge of the relevant literature recommended by the curriculum, are passive in practical classes, show a low level of culture while undertaking the tasks.

Grade "1" (one) – unacceptable (failed)
is given to the students who show lack of knowledge and competences within the educational standard or refuse to answer.

PLAN FOR PRACTICAL CLASSES

№№	Stage of Class	Visual Aids	Time in min
1.	Class organisation and instruction of students	Methodology reference books	10
2.	Student's basic knowledge control	Control questions, X-rays, medical histories, tables	45
3	Preparation for patients treatment	Control questions, X-rays, plaster models , medical histories	15
4.	Patients treatment	Patients with pathology connected with the previous class topic, X-rays, appointments diary, daily registration sheet	125
5	Checking the knowledge of the previous topic		20
6.	Home assignment	Methodology reference books	10

.

Application: The classes are held in a prosthodontic office.
The total class duration - 5 academic hours

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 1

Subject: Preparing the oral cavity for prosthetics. Methods of pain relief during tooth preparation. *The choice of drug and method of anesthesia.*

Purpose of the lesson: to consider the basics of medical ethics and deontology in the clinic of orthopedic dentistry, as well as measures to prepare the oral cavity for prosthetics; to teach how to choose and apply various methods of anesthesia and medicines in the preparation of hard dental tissues.

OBJECTIVES OF THE LESSON:

1. To get acquainted with the basics of medical ethics and deontology in the clinic of orthopedic dentistry.
2. Learn to determine the measures to prepare the oral cavity for prosthetics.
3. Familiarize yourself with various methods of anesthesia in the preparation of hard tissues of the teeth.
4. To master practical skills in the application of various methods of anesthesia and medicines in the preparation of hard dental tissues.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

To fully master the topic, the student must repeat:

1. Anatomical structure of the jaws and periodontium.
2. Methods of examination of dental patients.
3. Features of innervation and blood supply of the upper and lower jaws.
4. Morphological changes in the bone tissue of the jaws after the loss of teeth.

CONTROL QUESTIONS FROM RELATED DISCIPLINES:

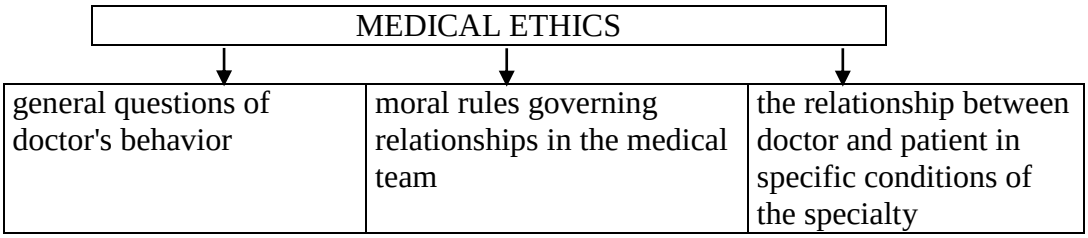
1. Anatomical structure of the lower jaw.
2. Anatomical structure of the upper jaw.
3. Anatomical structure of the periodontium.
4. Basic methods of pain relief in dentistry.
5. The main methods of examination of dental patients.

CONTROL QUESTIONS:

1. Components of medical ethics. Ethical problems in dentistry and methods for their solution.
2. Preparation of the oral cavity for prosthetics.
3. The nature of the reactions observed in response to the preparation of teeth. Explain the need for medical preparation of patients before the preparation of teeth.
4. Methods of anesthesia and the choice of drugs in the preparation of teeth.
5. Methods of injection anesthesia and indications for their use depending on the number and topography of the teeth to be prepared?
6. Possible complications in the preparation of teeth and their prevention.

Medical deontology is a set of ethical norms and principles of behavior of medical workers in the performance of their professional duties.

Scheme: “Components of medical ethics”



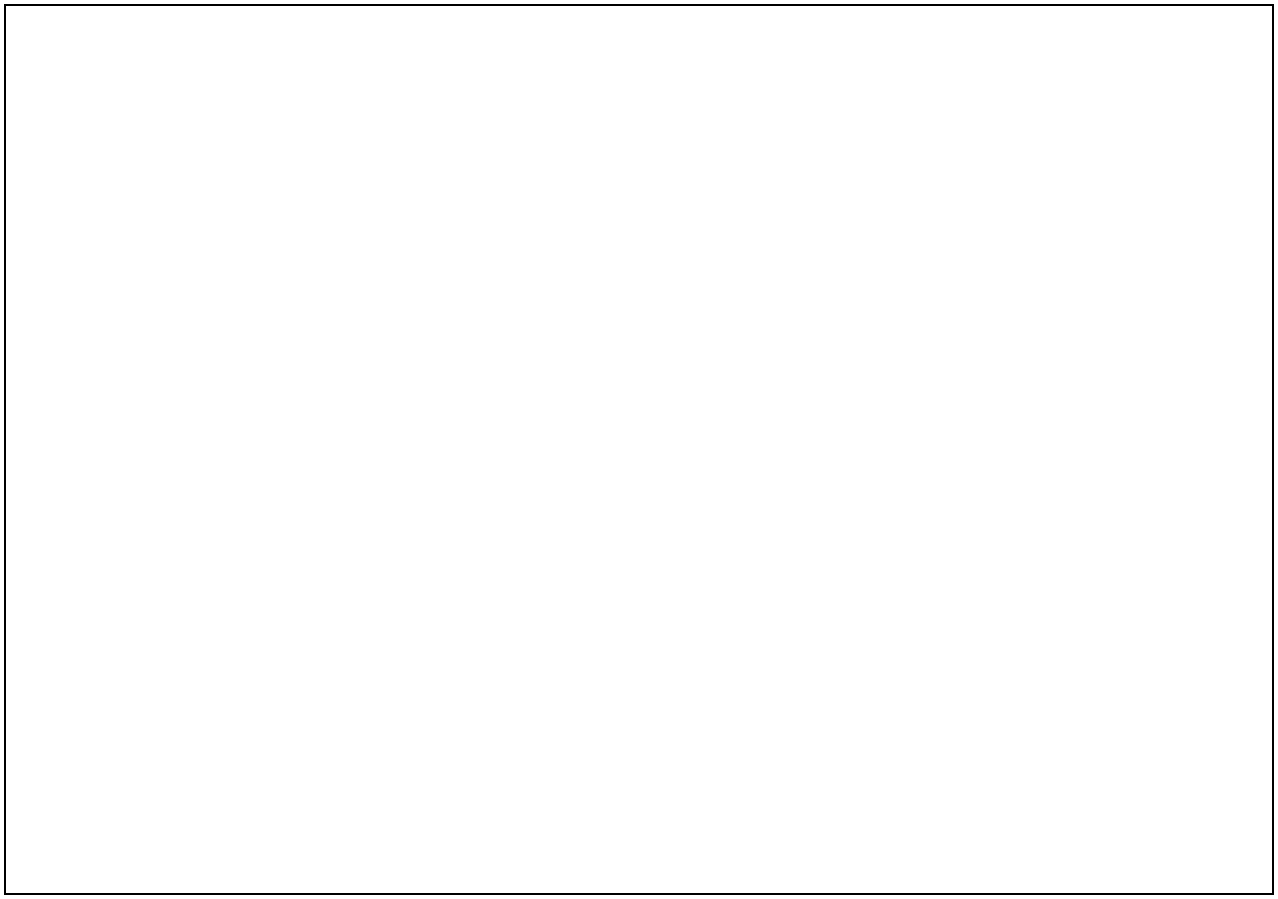
Scheme: “Ethical issues in dentistry”

Classification of professional and ethical problems	**Conflicting Parties**	**Example**
Individual	The doctor in himself	The doctor knows about the diagnostic error he made, but the patient and colleagues do not know about it
medical	doctor - patient	A mistake was made in the diagnosis of pulpitis, as a result of which a complication arose, which became known to the patient from another doctor
Collegiate	doctor - doctor	The doctor does not agree with the materials of the analysis of the case of his diagnostic error, presented at the medical conference by his colleague
brigade	Doctor - junior staff	Despite the doctor's repeated remarks, the nurse violates the sterilization treatment of instruments
Public	Physician - population	The population is informed that the doctor does not use modern methods of treatment
Administrative	doctor - administration	Guided by the interests of patients, the administration puts a doctor with a small child on duty on a day off
Collective	Doctor - team	The doctor does not agree with the decision of the team to refuse, to issue him a recommendation for obtaining the highest category
Social	Medical society - population	The population does not support the recommendations of the medical society to fluoridate drinking water in order to prevent caries

Scheme: "The main models for building relationships between a doctor and a patient"

Model	The role of the doctor	Model description
Active-passive	Performs its work without patient participation	It is based on the idea that the doctor knows better what the patient needs. The patient cannot participate in decision making
Patronizing	Explains to the patient what needs to be done to help him. Acts as a mentor	The patient is given only the information that, in the doctor's opinion, is necessary
Informative	The Role of the Competent Technical Expert	The doctor conveys all the information to the patient, and the patient himself chooses
Interpretive	Advise the patient and help him make a decision. Acts as an adviser	It is assumed that the patient only needs to clarify with the help of a doctor what is happening to him. He will make the decision
Advisory (negotiable)	Engages the patient in a discussion during which it helps them understand their health priorities	Based on the idea that the doctor can actively influence the formation of the patient's opinion and help him make the right decision

Scheme: "Preparation of the oral cavity for prosthetics"



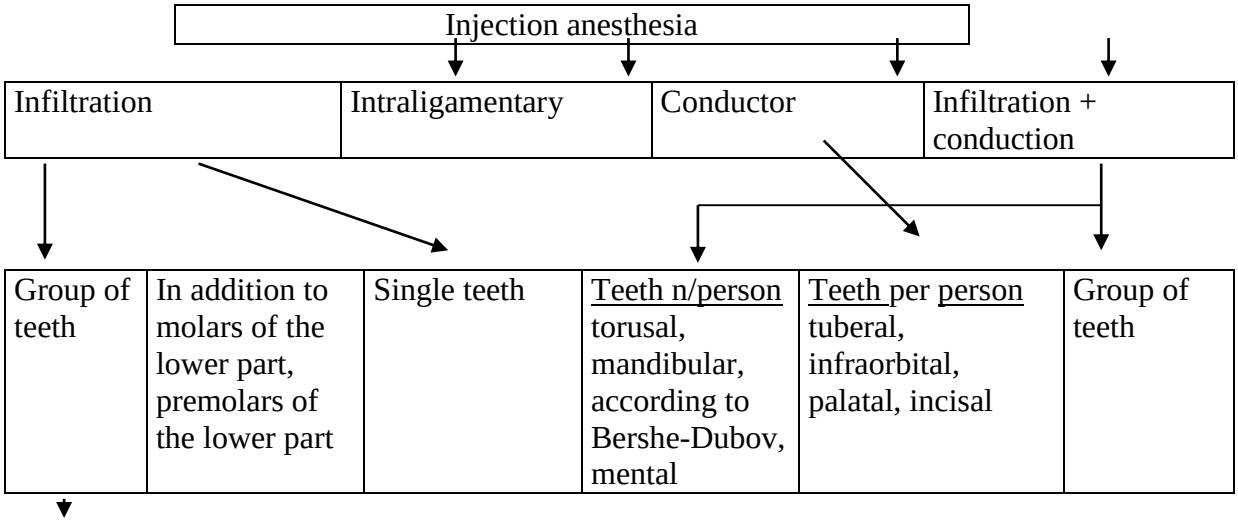
Scheme: "Methods of anesthesia during the preparation of teeth"

Anesthesia methods	Premedication	Injection anesthesia	anesthesia	Local application of anesthetics	Electroanesthesia	Audiovisual Methods

tranquilizers	Sedatives	Antipsychotics	Non-narcotic drugs	Infiltration	Conductor	Intraperiodontal

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

Scheme of OOD: "The use of injection anesthesia methods depending on the number and location of teeth"



Varieties of infiltration anesthesia: submucosal, subperiosteal, intraosseous, intracapillary, intrapulpar.

Scheme: "Duration of action of local anesthetics"

Name of anesthetic	Duration of anesthesia (in minutes) without vasoconstrictor	Duration of anesthesia (in minutes) with vasoconstrictor
novocaine	15-30	30-40
lidocaine	30-60	120-130
mepivucaine	45-90	120-360
prilocaine	30-90	120-360
articaine	60	180
bupivacaine	120-240	180-240

SITUATIONAL TASKS

1. The patient experiences fear, excitement before the upcoming preparation of teeth. How can this tension be relieved?

2. At the same time (in one visit) the preparation of vital teeth 16.14, 25.27 for metal crowns is to be done. What kind of anesthesia is indicated in these conditions?

3. Teeth 13,12,26 are to be prepared. The patient suffers from epilepsy. A history of intolerance to local anesthetics was revealed. What type of pain relief is indicated for the patient?

4. When preparing teeth 31,32,33, infiltration anesthesia with a 2% novocaine solution turned out to be ineffective. Your choice?

5. In order to reduce pain sensitivity during the preparation of the vital teeth of the lower jaw with a carborundum grinding head, the doctor used the ELOS-1 apparatus, the electrodes of which were connected in accordance with the instructions. When preparing the teeth, the therapeutic effect was not achieved. Indicate the location of the electrodes and the possible reasons for the ineffectiveness of anesthesia.

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.

2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.

4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 2

Subject: Defects of hard dental tissues. Methods of examining patients with defects of hard dental tissues. Dental photo protocol for planning orthopedic treatment of patients with crown defects. *Patient examination. Filling out medical documentation.*

Purpose of the lesson: To teach students how to examine patients with defects of hard dental tissues, to study the main classifications of crown defects and types of dental prostheses for their replacement; to familiarize students with the structure of a photo protocol used in orthopedic treatment of patients with crown defects, and to teach them how to fill out medical documentation.

OBJECTIVES OF THE LESSON:

1. Learn to determine the degree of damage to crown parts of teeth.
2. Familiarize oneself with the main classifications of crown defects and types of dental prostheses for their replacement.
3. Be able to conduct differential diagnosis of various crown defects.
4. Familiarize oneself with the basics of maintaining a photo protocol in orthopedic treatment of patients with crown defects.
5. Learn how to fill out medical documentation.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

To fully understand the topic, the student needs to review:

1. The anatomical structure of the jaws and periodontium.
2. Methods of examining dental patients.
3. Morphological changes in the bone tissue of the jaws after tooth loss.

Control questions from related disciplines:

1. The anatomical structure of the lower jaw.
2. The anatomical structure of the upper jaw.
3. The anatomical structure of the periodontium.
4. The main methods of pain management in dentistry.
5. The main methods of examining dental patients.

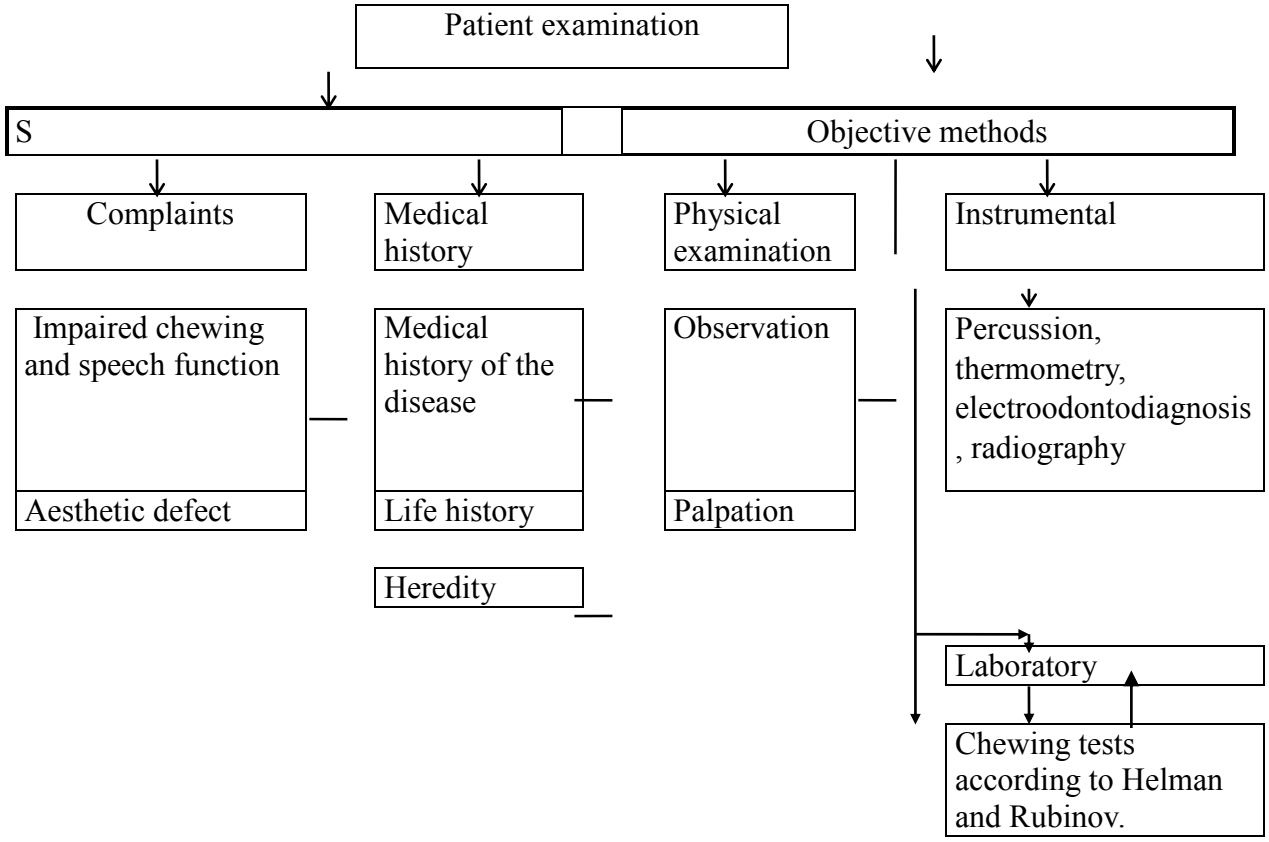
Control questions:

1. Diseases that lead to a violation of the anatomical shape, structure, and color of the hard tissues of the teeth.
2. Defects of the hard tissues of the teeth of carious and non-carious origin. Etiology. Clinic. Classification of tooth crown defects according to Black and Kurland. Index of destruction of the occlusal surface of the tooth (IDOST).
3. Methods of examining patients with defects of the crown part of the tooth.
4. Types of dental prostheses that restore the anatomical shape of the tooth.
5. The main areas of the maxillofacial region that need to be studied when conducting a photo protocol.
6. The main forms of medical reporting documentation in outpatient dental practice.

Scheme “Damage to the hard tissues of the teeth”

Damage to the hard tissues of the teeth		
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.		

LDS themes: "Examination of a patient with damage to 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	P r o b	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)			More than 80%
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.

Main reasons for the damage of hard tissues are carious and non-carious tooth lesions.

Tooth decay is a pathological process that occurs after the eruption of teeth, in which demineralization and softening of the hard tissues of the teeth occur, followed by the formation of a cavity defect. This leads to a disruption in the anatomical shape of the tooth crown and, as a result, its function. Carious defects can have different localization, size, shape, and depth.

Non-carious tooth lesions are divided into two main groups:

- Lesions that occur during the follicular development of tooth tissues, i.e., before eruption: enamel hypoplasia, enamel hyperplasia, tooth fluorosis, anomalies of tooth development and eruption, changes in their color, hereditary tooth development disorders;
- Lesions that occur after eruption: tooth pigmentation and dental plaque, tooth erosion, wedge-shaped defects, abrasion of hard tissues, tooth trauma, necrosis of hard tooth tissues, tooth hypersensitivity.

Enamel hypoplasia occurs as a result of metabolic disorders in ameloblasts of tooth buds. The development of hypoplasia is facilitated by a disturbance in protein and mineral metabolism in the fetus or child's body. By etiology, focal, systemic, and local hypoplasia are distinguished. In the case of focal form, both temporary and permanent tooth buds are affected, more often incisors, canines, and permanent molars. Clinically, a rough surface, yellowish discoloration, reduction in size, and uneven density of the tooth crown tissue are noted. Systemic hypoplasia is accompanied by a disruption in the structure of enamel only in the group of teeth that form at the same period of time. The formation of cup-shaped depressions of a round or oval shape is characteristic.

Fournier's, Hutchinson's, and Pfluger's teeth are considered a variety of systemic hypoplasia. The tooth crown acquires a peculiar barrel-shaped form with a semilunar notch on the cutting edge of the upper or lower incisors. Pfluger's teeth are characterized by a conical shape of permanent molars. Hypoplasia of the cutting edges and cusps contributes to the increased wear resistance of the hard tissues of the teeth and often leads to aesthetic dissatisfaction of the patient with the appearance of the teeth. In the case of local hypoplasia, one or two permanent teeth are affected.

Hyperplasia of enamel (enamel droplets) is an excessive formation of tooth tissue during its development, most often in the neck area of the tooth, at the border of enamel and cementum, as well as on the contact surface.

Fluorosis is the damage to the hard tissues of the tooth due to the consumption of drinking water with a high content of fluoride compounds. Fluoride is an enzymatic poison that toxicologically affects ameloblasts, leading to improper enamel formation.

Kapdepona dysplasia (Stenton-Kapdepon syndrome) is an inherited disorder of the development of primary and permanent teeth. Due to the inadequate structure of tooth tissues soon after their eruption, enamel chips off, leading to accelerated tooth wear, with teeth showing a weak response to all types of irritants.

Erosion of hard tooth tissues is a progressive cup-shaped loss of enamel and dentin on the vestibular surface. The shape of the affected area is irregularly round, the surface is smooth, and the base is hard and shiny. Mostly, the upper front teeth, premolars of both jaws, and lower canines are affected (usually not less than two symmetrically located teeth).

Wedge-shaped defects are most often observed on canines, premolars, and less frequently on incisors and molars. The etiology is not fully understood, but it is associated with disorders of the endocrine system, central nervous system, periodontitis, and other diseases. Defects are mostly located symmetrically on the vestibular surface of the tooth in its cervical region. The wedge-shaped defect is formed by a gingival plane that is horizontally positioned and a second plane that is positioned at an acute angle. The walls of the defect are dense, shiny, and smooth, and the pulp chamber is never exposed. Defects develop slowly and are accompanied by the deposition of replacement dentin.

Increased abrasion is a progressive (decompensated) process of loss of hard tooth tissues, which is accompanied by changes in the aesthetic, functional, and morphological characteristics of dental and peri-dental tissues, masticatory muscles, and temporomandibular joints.

The causes of morphological insufficiency of hard tooth tissues can be endogenous (inheritable predisposition, congenital nature, acquired - in neurodystrophic disorders, metabolic disorders) and exogenous (partial loss of teeth, parafunction and hypertonicity of masticatory muscles, chronic trauma, including harmful habits).

Trauma. Acute and chronic traumas are distinguished. Crown fractures can occur within the enamel, dentin, with exposure of the tooth cavity, or complete detachment of the crown. Acute trauma can result from being hit by a hard object, attempting to bite bone, opening a bottle with teeth, etc.

Chemical necrosis. Occupational hazards have a significant impact on the condition of enamel and dentin. The most pronounced changes are observed in workers in chemical plants involved in the production of acids and alkalis. Direct exposure to chemical agents leads to a decrease in the resistance of hard tooth tissues, and against this background, the influence of mechanical factors causes rapid loss of enamel and dentin. It is accompanied by significant pain from various irritants.

In carious and non-carious lesions of hard tooth tissues, hypersensitivity is observed - increased sensitivity of the tooth to mechanical, temperature, and chemical irritants.

Defects of hard tooth tissues can be restored using:

- Fillings;
- Inlays (microprostheses made in the laboratory);
- Veneers (laminate) (microprostheses restoring the vestibular surfaces of tooth crowns). Their technical production is similar to the technology of ceramic prostheses.
- Crowns (used in cases where the use of fillings, inlays, veneers is not feasible (IRPZ >50%);

Restorative post and core structures (cultivated inlays, post teeth) - used in cases of extensive destruction of the crown part of the tooth, when the use of artificial crowns is not possible.

Photoprotocol is one of the first components necessary for the implementation of orthopedic treatment, dynamic control of changes in the patient's facial profile, masticatory and facial muscles. By influencing the visual representational system, photographs leave vivid images in people's minds, serving as an effective motivational factor for patients. Video recording of a facial portrait in front view under different emotional states, as well as video recording of centric and eccentric positions of the lower jaw, contributes to a more accurate diagnosis of lip contours, smile lines, dynamic articulatory movements, which is undeniably significant for the proper treatment of dental patients.

Specialized equipment (camera flash retractors contrasters, etc.) is required for conducting a photoprotocol.

Structure of the photoprotocol for clinical dental examination

The structure is developed to implement a comprehensive approach to the treatment of orthopedic patients, including patients with defects of hard tooth tissues.

1. Diagnosis

1.1. Series of patient's face photographs

The patient stands, with a gray or white background. Lips are closed, muscles are relaxed. Photographs are taken in profile and front view.

1.2. Series of patient's lip photographs

The patient sits in a chair, the first photograph duplicates the smile. Subsequent photographs are taken with retractors. Photographs are taken in profile and front view.

1.3. Series of photographs of the occlusal surface of teeth.

The patient sits in a chair. Occlusal contacts, facets, wear areas, presence of carious cavities, direct restorations and dental prostheses, their condition, as well as the shape of dental arches are evaluated.

1.4. Series of photographs in habitual occlusion.

The patient sits in a chair. The alignment of the midline of the upper and lower jaws, relationship to the lip frenulum, symmetry of the shape and position of teeth in both jaws, contour of the gingival margin are evaluated.

1.5. Series of photographs of the eccentric position of the lower jaw in anterior and lateral occlusions.

1.6. Series of photographs with a facial arc.

Photographs are taken in profile and front view for analysis of the position of the upper jaw relative to the Camper's horizontal.

2. Dynamic observation

2.1. Series of training and control photographs for performing myogymnastics.

2.2. Photographs with temporary orthopedic prostheses.

2.3. Photographs with caps.

SITUATIONAL TASKS

1. Patient A came with complaints of aesthetic defects of the frontal teeth of the upper jaw. Objective: on the vestibular surface of teeth 11, 13, 21, 23, there are whitish stripes, with no change in relief upon probing. On the proximal surfaces of teeth 12, 22, there are defects in the form of cavities, dark and painful upon drying. Make a diagnosis. Develop a treatment plan.

2. The patient has a class 1 cavity according to Black on tooth 26, visually covering 2/3 of the occlusal surface. How to calculate IRPZ? What type of structure needs to be made?

3. Patient B, 46 years old, working in a galvanoplasty workshop, came to the clinic with complaints of "wearing down" of tooth enamel. Objective: the enamel surface of teeth 12, 11, 21, 22 is matte, and in areas where it is absent, the dentin is brown in color and the incisal edges of the teeth are worn down. The bite is orthognathic. The rest of the teeth are intact. Identify the causal factor of enamel wear. Formulate a diagnosis.

4. After removing softened dentin in a class 1 cavity according to Black in tooth 37, patient B has thin walls and an IRPZ of 0.8. Make a diagnosis. Propose a treatment plan.

5. Patient A came with complaints of defects in the teeth that are formed in the subgingival area and are horizontally located in the form of wedges. The walls of the defects are dense, shiny, smooth, and the cavities of the teeth are not exposed. Make a diagnosis. Propose a treatment plan.

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 3

Subject: Working auxiliary impressions and modern materials for their obtaining. Stages of obtaining an impression. Obtaining a digital impression. Laboratory scanning of models.*Obtaining impressions from alginate and silicone materials.*

Purpose of the lesson: To study the types of impressions; to study the properties of the used impression materials and the requirements placed on them; to learn the technique of obtaining impressions.

OBJECTIVES OF THE LESSON:

1. Learn to differentially choose an impression depending on the clinical situation.
2. Familiarize oneself with the properties of impression materials and their application in the clinic.
3. Be able to correctly and sequentially, according to the technique, obtain an impression from the upper and lower jaws.
4. Evaluate the impression after obtaining it.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

1. Be able to collect a life and medical history from the patient.
2. Be able to conduct a thorough clinical examination of the oral cavity of the patient.
3. Knowledge of the anatomical structure of the lower jaw.
4. Knowledge of the anatomical structure of the upper jaw.

CONTROL QUESTIONS FROM RELATED DISCIPLINES:

1. Features of the anatomical structure of the lower and upper jaws.
2. Features of the structure of the mucous membrane of the oral cavity.
3. Concepts of plasticity, elasticity, viscosity.

CONTROL QUESTIONS:

1. Definition of the concept of "impression", types and classification of impressions.
2. Types of impression trays and rules for their selection.
3. Technique for obtaining impressions from the lower and upper jaws.
4. Evaluation of the obtained impression and possible errors made during its obtaining.
5. Classification of impression materials.
6. Technique for obtaining one- and two-step impressions, materials.
7. Methods, means, and technique of gingival retraction.

Impression - a negative (inverse) representation of the surface of hard and soft tissues located on the prosthetic bed and its boundaries.

Prosthetic bed - a complex of organs and tissues in direct contact with the dental prosthesis. (E. I. Gavrilov). The concept of the prosthetic field also includes the tissues of the maxillofacial area that are in the zone of indirect action of the prosthesis.

A model is cast from an impression, which replicates anatomical formations in the oral cavity and is a positive representation of the prosthetic bed. Models have different purposes.

Working models are used directly for the manufacture of orthopedic structures. They must be cast from durable plaster and accurately reproduce the prosthetic bed.

Diagnostic models are used to refine the diagnosis in complex clinical situations and treatment planning.

Control models are necessary to assess the effectiveness of the treatment being carried out.

Auxiliary models are needed to display opposing teeth and fully reproduce the clinical situation in the oral cavity.

Depending on the purpose of the model, clinical conditions in the oral cavity, and the required level of reproduction of details of the prosthetic bed, a particular type of impression is chosen.

Anatomical impressions are a static representation of the prosthetic bed and its surrounding tissues. They are taken when manufacturing all types of orthopedic structures. During the process of taking an anatomical impression, the soft tissues that limit the edges of the impression are at rest. Standard and individual trays are used to obtain anatomical impressions.

Functional impressions are taken when making removable dentures, when it is necessary to ensure their fixation by means of functional suction with the creation of a valve zone. Rigid individual trays, carefully fitted in the oral cavity, are used for taking functional impressions. In the process of taking a functional impression, active and passive formation of its edges by soft tissues that are in function is necessary.

Impressions are classified based on the degree of pressure exerted by the impression material on the tissues of the prosthetic bed:

- Compression impressions;
- Relief impressions;
- Differentiated impressions.

The choice of the degree of mucocompression depends on the characteristics of the oral mucosa.

- In most cases, it is recommended to take differentiated impressions, as the compliance of the mucous membrane is usually different in different areas of the prosthetic bed.
- Decompression areas are created in areas with atrophied or excessively compliant mucous membrane, as well as in the presence of a "loose ridge" - an alveolar process devoid of bone foundation.
- Compression impressions are indicated when there is a mucous membrane with a uniformly moderately expressed submucous layer. Different degrees of compression are achieved by creating perforations in the impression tray and using impression materials with different mucocompressive properties.

	Hard	Elastic
Hardened as a result of chemical reactions (irreversible)	1. Plaster 2. Zinc-oxide eugenol pastes	1. Alginate hydrocolloids 2. Non-aqueous elastomers - polysulfides - Silicone C - polyethers -SiliconeA(vinyl siloxanes)
Hardened as a result of temperature changes (reversible)	Thermoplastic compounds	Agar-agar hydrocolloids.

Requirements for the quality of the impression:

- A high-quality impression should accurately reflect all elements of the prosthetic bed and the surrounding tissues. This is necessary for clear determination of the boundaries of the prosthetic bed and the formation of an adequate prosthesis edge.
- There should be no bubbles, pores, drags, or other defects on the surface of the impression.
- The representation of the dental arch or alveolar process in the impression should be located in the middle between the borders of the tray.
- The edges of the impression should be well-defined.

Standard or individual impression trays are used to obtain impressions. Standard trays are made of metal or plastic and differ in shape, size, number, and size of perforation holes.

There are certain guidelines for selecting the appropriate impression tray:

- The tray should completely cover the prosthetic bed and provide a rigid support for the impression material. Wax extension of the tray is not allowed.
- The dental arch should be located in the middle of the tray for teeth.
- When placed in the oral cavity, the tray should not create compression on specific areas of the prosthetic bed.
- The height of the rim of the impression tray should correspond to the height of the alveolar process. If the rim of the tray is significantly lower than the transition fold when placed on the dental arch, it will be difficult to compensate for this gap with the impression material. If it is higher, it will traumatize or compress the mucous membrane and interfere with the formation of the impression edge.
- When taking an impression for making a removable prosthesis, the tray should cover all significant anatomical formations.

Most impression materials have insufficient adhesion to the impression tray. This often leads to local or complete detachment of the impression material from the tray during impression removal. Therefore, the edge of the tray is covered with adhesive tape or an adhesive is used to better fix the impression material to it. Adhesives for alginate materials are usually available in spray form, while for elastomeric materials, they are often in liquid form applied with a brush.

Requirements for impression materials:

- The impression material should be non-toxic and biocompatible to avoid any chemical or thermal irritation to the oral tissues.
- The material should have a certain degree of structural viscosity, allowing it to adhere and flow over the surface of the oral tissues.
- Accuracy in reproducing the surface is crucial for an accurate impression.
- The material should have the ability to recover its shape after elastic deformation, ensuring that it returns to its original position after removal from the oral cavity.
- Thixotropy is important, as it allows the material to flow under compression but maintain its shape without pressure. This property is necessary for controlled movement of the impression material.
- The material should have high tear resistance to prevent detachment or tearing of important elements of the impression.
- Good hydrophilicity is necessary for the material to displace moisture from the surface of the prosthetic bed, preventing the formation of bubbles or defects in critical areas of the impression.
- Working characteristics of the material are important, including sufficient working time for proper placement and manipulation in the oral cavity, followed by rapid setting and development of elastic properties.
- The impression should maintain stability over a sufficient period of time, with low linear shrinkage and resistance to dimensional changes in different environments.
- In the case of two-layer impressions, the first layer should have a certain degree of hardness to prevent deformation or displacement when the corrective layer is applied.
- The material should be resistant to disinfection to prevent transmission of pathogens or infections.
- Contrast in color between different layers of the impression material is important for reading fine details in the impression.
- Taste characteristics of the material are important to ensure a comfortable experience for the patient during impression taking.

Requirements for obtaining two-layer impressions with elastomers:

- The impression should be taken using materials with different viscosities.
- Two-layer impressions are recommended when an accurate impression of both the supragingival and subgingival parts of the prosthetic bed is needed.
- The first layer should be a preliminary impression using a high-viscosity material.
- The second layer should be a final impression using a flowable impression material.

- It is desirable to wait at least 6-7 days after tooth preparation before taking the working impression for non-removable prostheses.

- The working impression should provide an accurate gypsum model that clearly shows the preparation margin and the width of the finish line.

- Different retraction techniques can be used to displace the gingiva and expose the finish line.

- After applying adhesive to a standard impression tray, the base material is mixed with a catalyst according to the manufacturer's instructions and placed in the tray.

- The tray with the impression material is inserted into the mouth, centered, and pushed into place.

- Proper and uniform compression of the prosthetic bed with the impression material should be ensured by placing fingers on the tray in three functionally oriented groups of teeth.

- The vector of tooth immersion in the impression material should correspond to the axis of the anterior teeth.

- "Rocking" movements should be avoided when removing the tray with the impression.

- To minimize deformation of the impression, it is recommended to remove it with one quick motion directed opposite to the insertion vector of the tray.

- After removing the tray, the impression should be rinsed under running water.

Preparation of the preliminary impression for applying correcting material

The preparation of the first layer involves ensuring its ability to be reinserted into the oral cavity and easy removal of excess flowable material. To do this, it needs to be thoroughly dried and "relief channels" for the correcting material should be created by making incisions with a scalpel or a special instrument from both the vestibular and oral sides. This is done to prevent the second layer from deforming or displacing the first layer, but rather refining it.

Interdental septa and any elements of the first layer that may hinder easy reinsertion into the oral cavity and placement on the dental arch should be trimmed. Afterward, the impression should be air-dried and any remnants of the trimmed material should be carefully removed.

If necessary, for ease of orientation when reinserting the impression, a notch corresponding to the midline between the central incisors can be made on it. For novice orthopedic doctors without sufficient experience, we recommend checking the quality of the prepared preliminary impression by reinserting it before applying the correcting layer.

Obtaining the final two-layer impression

The correcting material is mixed with a catalyst according to the manufacturer's recommendations on glass or special paper using a spatula or an automatic mixing device. It is important to ensure thorough mixing and minimize the formation of air bubbles during mixing. In this regard, preference should be given to devices for automatic mixing of the material. After mixing, the correcting material is applied to the prepared preliminary impression. It should be placed in the area of the entire dental arch. There is no need to cover the entire surface of the impression with it, but it should be noted that applying the correcting material only to the area of prepared teeth, which is often practiced by doctors to save impression material, is a clinical mistake.

Before inserting the tray into the oral cavity, retraction threads or other means of gingival retraction should be removed. The prosthetic bed should be dried.

After inserting the impression into the oral cavity, it is placed on the dental arch and advanced, creating dynamic pressure. The degree of finger pressure on the impression depends on the viscosity of the correcting material. Unfortunately, this value is difficult to describe. It can only be noted that when using very flowable correcting materials, excessive compression should not be created. When all recommendations are followed, a two-layer impression obtained using the two-step technique has high-quality surface detail representation.

One-step technique for obtaining two-layer elastomeric impressions

The one-step technique for obtaining two-layer impressions from elastomers is also called the "double mixing" technique or sandwich technique. The advantage of this technique is the absence of deformation of the first layer of the impression by the second layer, which is due to the simultaneous introduction of both layers of material in a plastic state onto the prosthetic bed. The main disadvantage

is the lower quality of surface detail representation compared to the two-step technique, which is due to the lower dynamic pressure on the correcting material when using the one-step technique.

In addition, it should be noted that when using this technique, preference should be given to materials whose base layer has increased final elasticity. The procedure for obtaining an impression using the double mixing method includes standard steps of tray selection, application of adhesive to it, drying of the prosthetic bed after removing gingival retraction agents. Furthermore, the peculiarity of taking the impression lies in the simultaneous application of the first and second impression materials to the tray and applying the correcting layer to the gingival sulcus apical to the finish line.

For this purpose, special cannulas with a tail part are provided with mixing material cartridges.

Procedure for gingival retraction during the removal of two-layer impressions

This procedure is necessary to retract the marginal gingiva and allow maximum penetration of the impression material into the gingival sulcus in order to obtain an accurate impression of the subgingival portion of the tooth and surrounding tissues.

In the literature, the following options for gingival retraction are described: mechanical, chemical, and surgical.

Mechanical retraction involves the insertion of threads or rings under the gingiva, which, when swollen by the gingival fluid, increase in volume and push back the marginal gingiva, exposing the gingival sulcus.

There are also special instruments called retractors that can be used during preparation to prevent trauma to the marginal gingiva by holding it away from the working surface of the bur.

Mechanical retraction can also include the use of provisional crowns that are carefully fitted and refined to the finish line. Often, after removing such crowns, there is no need for additional gingival retraction.

The chemical method allows achieving the retraction effect without using mechanical methods by using various chemical compounds. This is achieved through the vasoconstrictor and hemostatic effects of compounds such as potassium and aluminum sulfates, epinephrine.

The most common method of retraction combines mechanical retraction with chemical retraction. This is done using a thread soaked in a hemostatic solution.

The essence of the procedure lies in the vasoconstrictor and hemostatic effect, accompanied by the swelling of the thread under the influence of gingival fluid. At the same time, there are limitations on the use of epinephrine due to its general vasoconstrictive action. Thus, it is not recommended to use more than 4 threads simultaneously in one patient. It is necessary to inquire about the presence of hypertension and other cardiovascular diseases in the patient. In this case, threads soaked in aluminum sulfate are used. In addition, in certain cases, epinephrine can cause local tissue necrosis.

Threads are available in several sizes, denoted by the numbers 00, 0, 1, 2, 3. The thickness of the thread is chosen individually, depending on the depth and width of the gingival sulcus. There is also a technique of widening the sulcus, where the diameter of the thread is gradually increased (double thread technique). The thread should be inserted without pressure to avoid gingival recession.

Currently, there are gels and pastes in cartridges for easy introduction into the gingival sulcus. Their action is based on the property of kaolin to expand under the influence of liquid and the hemostatic effect of aluminum oxide. These agents are the most gentle compared to mechanical retraction, but with prolonged exposure, they can cause chemical burns to the mucous membrane. Therefore, it is necessary to strictly adhere to the exposure time specified by the manufacturer. Examples include Retragel (OMEGA-DENT) and Expasy! (Kerr).

Digital impressions are accurate replicas of the hard and soft tissues of the oral cavity obtained using intraoral scanning cameras.

Advantages of digital impressions:

- Improved quality of impression images, resulting in more accurate prosthetic fabrication.
- Reduced time spent by the patient in the dental chair (no need for tray selection and mixing of impression material).
- Elimination of the possibility of error during impression taking and the influence of material shrinkage on the quality of prosthetic constructions.

- Scanning of teeth requiring restoration, as well as antagonist teeth and their occlusal relationships, takes 3-5 minutes.

- Digital impressions can be saved directly in electronic format, saving space and facilitating efficient record-keeping.

Laboratory scanning is another type of dental 3D scanning, in addition to intraoral scanning. Instead of scanning the patient's oral cavity, images are taken in the dental laboratory by scanning an impression made using the standard method.

Using directed structured light, the scanner collects a cloud of points - the coordinates of the object in space - and uses them to create a 3D model. This process is automated and does not require human intervention. Special software analyzes the collected data and creates a digital image on the monitor screen.

The advantage of this scanning method is its high accuracy. The conditions for scanning are favorable, with good lighting, full access to all areas of the object, and its immobility, resulting in good quality. Each detail is accurately captured without distortion. However, the scans do not provide information about the real color of the teeth, so the color and shade will be determined by the dentist. Most laboratory 3D scanners have functions that allow for any necessary light corrections and other options to modify the 3D model according to specific requirements.

Therefore, laboratory scanning equipment makes the work of the dentist much more comfortable and efficient. The capabilities of 3D modeling allow for various manipulations with the obtained model to achieve an ideal result, eliminating the need for rework. This saves both the dentist's time and the patient's money.

SITUATIONAL TASKS

1. Direct prosthetics is the recommended treatment for Patient A, who is experiencing mobility in their lower front teeth. This involves creating a prosthesis to restore function and stability to the affected teeth. The time required to obtain working impressions can vary depending on the specific case and the dentist's schedule.

2. The dentist made an error in the impression-taking process for Patient B. While the contours of the supporting teeth and necks of other teeth were clear, the edges of the impression were not well-defined. This indicates a lack of proper border molding, which may require the impression to be remade to ensure accurate results.

3. In the case of Patient C, who has partial secondary adentia in the upper jaw (Kennedy Class II) and a moderately expressed torus, an impression of the upper jaw should be taken using a custom tray. This will provide an accurate representation of the patient's oral structures and aid in the fabrication of appropriate prosthetic restorations.

4. The dentist made a mistake by leaving the polyether impression material in water for several days before obtaining a gypsum model. Polyether impressions should be poured immediately after removal from the patient's mouth to prevent distortion or inaccuracies caused by prolonged exposure to moisture.

5. For creating a metal-ceramic crown, the dentist should choose the polysulfide impression material over the alginate material. Polysulfide offers better accuracy and detail reproduction, making it more suitable for precise prosthetic work like crown fabrication.

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.

2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.

4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 4

Subject: Inlay, indications for use. Modern structural materials and methods for manufacturing inlays. *Determining the treatment tactics of patients with the use of inlays.*

Purpose of the lesson: study the indications for the use of inlays; study the varieties of materials used for inlays manufacturing, as well as the properties of the used materials and the requirements for them; study the peculiarities of methods for manufacturing inlays, teach how to determine the treatment tactics using inlays.

OBJECTIVES OF THE LESSON:

1. Learn to determine the degree of the coronal parts of the teeth damage.
2. Learn to classify the defects of the crowns of the teeth.
3. Be able to determine the treatment tactics and to choose dentures for replacement of defects in the crowns of teeth.
4. Be able to carry out differential diagnostics of various tooth crown defects.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

To fully master the topic, the student must revise:

1. Anatomical structure of the jaws, teeth and periodontium.
2. Methods of dental patients' examination.
3. Morphological changes in the tooth and surrounding tissues with inflammation of the pulp

CONTROL QUESTIONS FROM RELATED DISCIPLINES:

1. Anatomical structure of the lower jaw
2. Anatomical structure of the upper jaw
3. Anatomical structure of teeth
4. Anatomical structure of the periodontium
5. Basic methods of anesthesia in dentistry
6. Basic methods of dental patients' examination
7. Classification of defects in crowns of teeth according to Black's one

CONTROL QUESTIONS:

1. Types of dentures that restore the anatomical shape of a tooth.
2. Purpose of inlays. International classification of inlays.
3. Indications for the defects correction in the crown of the tooth with inlays. Tooth Occlusal Surface Failure Index (TOSFI).
4. Advantages of inlays over fillings.
5. Modern structural materials for the manufacturing inlays.
6. General principles of the formation of cavities for the inlay. Methods of manufacturing inlays.

Defects in the crowns of teeth of various origin are the earliest and the most common form of dental system damage. They include loss of enamel and dentin, anomalies in size and shape, discoloration of the tooth.

For defects in the crowns of teeth of classes 1 and 2 according to Black's classification, V. I. Milikevich proposed index TOSFI (Tooth Occlusal Surface Failure Index). This index shows the percentage of the size of the cavity-filling area to the size of the chewing surface of the tooth. Depending on this percentage, using the TOSFI index, indications for the replacing of defects in the hard tissues of the tooth crown with various types of orthopedic structures are determined as follows:

- inlays (TOSFI 20-50%);
- artificial crowns (TOSFI 50-80%);
- pin structures (TOSFI > 80%).

According to the topographic feature and the complexity of tooth preparation, *V. Yu. Kurlyandsky* identified 3 classes of cavities:

- located on one surface of the tooth crown (one-sided);
- located on two surfaces of the tooth crown (double-sided), while the cavity is located on any of two sides of the tooth crown, for example, chewing and approximal, cutting and approximal, etc.;
- located on three sides of the tooth crown, for example, two approximal and chewing; approximal, cutting and palatal, etc.

Wenstein-Gorodetsky classification defines*:*

- cavities located on the same surface;
- cavities located on any of two or more surfaces.

MOD classification: M - medial, O - occlusal, D - distal, V - vestibular, L - lingual surfaces.
For example: LO - a cavity located on the lingual and occlusal surfaces, etc.

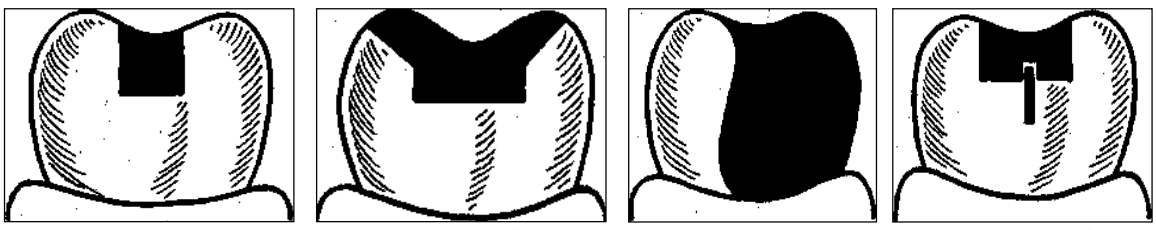
Inlay (insert) – a micro-prosthesis made in a laboratory to replace a defect in a tooth crown.
Unlike a filling, the inlay is inserted into the prepared cavity not in a plastic state, but in a solid one, which allows to avoid a number of significant disadvantages typical for fillings, in particular, to compensate shrinkage, and, therefore, to improve the margin fit and to reduce the probability of caries relapse.
The first definition of a microprosthesis was given in French as "blok metaligue coule", which means a cast metal block.
Later, in the United States and other English-speaking countries, the term "inlay" became widely used, which means "located inside."
In German it is called "Gussfülung" and means a cast filling, inlay.
In Russian specialized literature the term "вкладка" (inlay) is used more often, much less often the term "вставка" (insert) is used.

Inlays can be classified:
A. By topography and structural features as:

- ***inlay*** [`inlei], as a rule, it is located on the occlusal tooth surface, restoring its anatomical shape. The tops of the tubers are always preserved (Fig. 4.1a).

The variants of such microprostheses are inlay-O: an inlay that restores the occlusal surface, inlay-OD and inlay-OM: inlays that restore the occlusal-medial or occlusal-distal surfaces, inlay-MOD: an inlay that restores the occlusal and both approximate surfaces of a tooth;

- ***onlay*** [`onlei] is located on the chewing surface of the crown part of a tooth and serves for restoring its anatomical shape, covering one or more occlusal wear facets. The side walls of the tooth are partially preserved. (Fig. 4.1*b*);
- ***overlay*** [ouve`lei] restores the anatomical shape of the entire chewing surface and partially destroyed walls of the crown part of a tooth (Fig. 4.1c);
- ***pinlay*** [`pinlei] is an inlay that has additional retention devices in the form of pins (Fig. 4.1d).



a ***b*** ***c*** ***d***

Fig. 4.1. Types of inlays by topography and structural features:
a — inlay; *b* — onlay; *c* — overlay; *d* — pinlay

B. According to material and manufacturing technology there are:

- **Metal** (from alloys of noble and base metals). Manufacturing technology is metal reproduction casting on wax or plastic. Depending on the method of obtaining a reproduction for the future inlay, there are direct and indirect methods of manufacturing metal inlays.
- **Composite** (plastic/polymer). They are made from polymeric materials using photo- or chemical polymerization.
- **Ceramic.** Manufacturing technologies are traditional sintering of the ceramic mass on a refractory model, casting of the ceramic mass under pressure, milling.
- **Combined** (metal-ceramic or metal-composite). Today a high-precision technology for manufacturing microprosthesis frames using galvanoforming is used.

C. According to its functional purpose they are:

- ***Restoring*.** They serve to recreate the anatomical shape and functional integrity of the crown part of a tooth.
- ***Supporting*.** In case of small included defects in the dentition, these inlays can serve as supporting elements of adhesive bridges.
- ***Splinters***. In the case of periodontopathy, they are functioning as a splint for hypermobile teeth by manufacturing beam (inlay) splints.

GENERAL PRINCIPLES OF FORMING CAVITIES FOR INLAYS

There is a number of prerequisites that should be taken into account before starting the preparation of cavities for inlays. They are:

- the nature of the relationships between occlusal contacts and preparation line;
- functional load on the remaining walls of the cavity and the type of occlusion;
- the thickness of the remaining walls of the cavity;
- the presence of defects such as erosion, abrasion or cracks in hard tissues.

The general principles of forming cavities for inlays are the following:

- When preparing the tooth cavity, the peculiarities of the future inlay manufacturing technique should be taken into account.
- The cavity is shaped the way to allow an easy insertion and removal of the inlay.
- The formed cavity should be asymmetrical or it should have additional recesses that serve as a guide when inserting the inlay.
- Cavity preparation in small thickness areas of hard tissues should be carried out carefully and the topography of the pulp chamber and age characteristics should be taken into account as well.
- In a formed cavity the walls should not have undercuts. The overhanging edges of the cavity are excised at the stage of preparation or leveled with a flowable composite, which has greater fluidity and elasticity compared with traditional composites. One of the stages of pre-restoration is the leveling of undercuts, the so-called block-out technique, which allows to create a cavity geometry suitable for indirect restoration (it should have optimally the same thickness all over).
- The bottom of the formed cavity should be flat. Packable composite materials can be used to level the bottom of the tooth cavity at the stage of pre-restoration.

- The internal and external transitions of the prepared cavity boundaries should be made round. The formation of the cavity in this way prevents the development of mechanical stresses during the future restoration and allows to make more accurate inlays.
- The minimum depth of hard tissue preparation (inlay thickness) should be at least 1.5 mm for metal inlays and 2.0 mm for aesthetic (ceramic and composite) inlays.
- The minimum width of the inlay on the occlusal surface is at least 2 mm for premolars and 2.5-3 mm for molars, including the isthmus area.
- The outer walls of the prepared cavity should be separated slightly, which means the entrance part of the cavity should be a bit wider than its bottom. The most suitable, in terms of retention and strength of the future restoration, is the divergence of the walls with the angle of 6–10 degrees.
- If the thickness of the tuber hard tissues after cavity preparation is less than 1.5 mm, the tuber should be covered with a microprosthesis in order to avoid chipping caused by the chewing load. Removing the most part of the caries-affected tuber and saving its smaller intact part is a mistake, as this leads to weakening of the future restoration along the occlusal edge on the descending slope of the tuber.
- Along with giving the cavity the desired shape, the preparation must necessarily include a careful removal of pathologically altered hard tissues of the tooth, including decalcified chalky enamel. To control the quality of the affected tissues removal, special dyes can be used: caries detectors (Canal Blue (VDW), Caries Marker (VOCO), SNOOP (Pulpdent), Caries Detector (Kuraray), etc.).
- If there are several medium-sized cavities in a tooth, they should be combined into one cavity with complex configuration.

The formation of a cavity for the inlay should be carried out by using well-centered diamond and hard-alloy dental drills with a turbine handpiece or a high-speed micromotor with adequate water-air cooling. It is advisable for beginners to use ready-made sets of abrasive instruments designed specifically for preparing cavities for indirect restorations (Esthetic Inlay/Onlay kit and Nixon Inlay/Onlay kit (Brassler/Komet); Logic sets N1-7 (New Technology Instruments); Esthetic Inlay/Onlay kit, Baltzer Preparation set and Meschke Preparation set (Meisinger); All Ceramic restorations set (Shofu), etc.).

Compulsory isolation of the working area and control of salivation are necessary steps by manufacturing the indirect restorations. To isolate the working area, it is recommended to use a cofferdam. The application of a cofferdam helps to isolate the working area from saliva, provides partial retraction of the gingival margin and prevents inhalation of the water-air mix and particles of hard tissues of a tooth.

If necessary, anesthesia is used, which may be needed when preparing vital teeth or making retraction of the gingival margin.

Certainly, all the above mentioned rules of preparing cavities for inlays should be taken into account, but first of all, one should proceed from those local and general factors that are defined by a specific clinical situation.

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. Patient K., 45 y. o., in tooth 36, a deep cavity of class 1 according to Black's classification with parallel walls was formed. Give an assessment. What complications are possible?

4. Patient I., 28 y. o., in tooth 46 a cavity of class 5 according to Black's classification with a flat bottom was formed. Give an assessment. What complications are possible?

5. Patient M., 42 y. o., for the manufacture of a ceramic inlay in tooth 37, a cavity of class 1 according to Black's classification was formed and a fold was made along the edge. Give an assessment. What complications are possible?

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 5

Subject: Features of the formation of cavities for inlays, depending on the topography and size of the defect. Clinical and laboratory stages of making inlays using direct and indirect methods. *Preparation of teeth for inlays on phantoms.*

Purpose of the lesson: teach students how to make the right choice about tools and equipment needed for the manufacturing inlays; teach how to prepare teeth for inlays and how to make inlays using direct and indirect methods.

OBJECTIVES OF THE LESSON:

1. Study various modes for preparation of hard tissues of a tooth when forming cavities for an inlay.
2. Master practical skills of choosing abrasive instruments when preparing a tooth for an inlay,
3. Familiarize yourself with the features of mechanical surface treatment of structural materials for manufacturing inlays.
4. Learn how to prepare cavities of various localization for inlays.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

To fully master the topic, the student must revise:

1. Anatomical structure of the jaws, teeth and periodontium.
2. Methods of dental patients' examination.
3. Morphological changes in the tooth and surrounding tissues with inflammation of the pulp
4. Characteristics of the materials used for manufacturing inlays.

CONTROL QUESTIONS FROM RELATED DISCIPLINES:

1. Anatomical structure of the lower jaw
2. Anatomical structure of the upper jaw
3. Anatomical structure of teeth
4. Anatomical structure of the periodontium
5. Basic methods of anesthesia in dentistry
6. Physical and mechanical characteristics of aesthetic dental materials.
7. Basic methods of dental patients' examination

CONTROL QUESTIONS:

1. Anatomical features of the hard tissues and pulp structure of tooth crowns (safety zones).
2. General principles for the formation of cavities for the inlay.
3. Ways of redistribution of chewing pressure on the tissues of the tooth and inlays.
4. Features of taking impressions for inlays manufacturing.
5. Direct and indirect method of making inlays, clinical and laboratory stages.
6. Mistakes and complications by prosthetics of dental defects with inlays and criteria for assessing the quality of a manufactured inlay.

Preparation of the cavity for the inlay means the removal of softened dentin with the formation of the main and an additional cavity, if necessary.

When preparing teeth for inlays, apply the following rules:

- the walls of the prepared cavity should be parallel and perpendicular to the bottom (if the cavity is deep, the walls of the cavity should be separated slightly (diverged), i.e. the entrance part of the cavity should be a bit wider than its bottom);
- an asymmetric box-shaped cavity is created, from which the wax reproduction (model) of the inlay can be removed in one direction only;
- the wall on the side of the pulp must be thick enough to protect it from thermal influence from the side of the inlay metal;

- additional fixation elements are created within healthy hard tissues of a tooth in such a way that they prevent the displacement and tipping of the inlay under the action of vertical and transversal forces of masticatory pressure;
- when forming cavities in tight proximal areas, a cut is made; then the contacting part of the tooth is removed, after that free access to the carious cavity is open and its formation is facilitated;
- to prevent the development of secondary caries, a prophylactic expansion of the cavity is made and a bevel (fold) is created along the enamel edge, grinding it with an angle of 45 degrees to the axis of a tooth, which makes approximately 1/3 of the enamel layer thickness (for metal inlays);
- the cavity should be asymmetrical or it should have additional recesses that serve as a guide when inserting the inlay;
- the cavity should have sufficient depth, sink into the dentin and not move under the influence of masticatory pressure;
- the process of cavity formation should be painless, which to a certain extent depends on the sharpness of the instruments, the accuracy and speed of their rotation, air-water cooling, the use of anesthesia and, what is most important – gentle working methods.

The conditions for fixing the inlay are improved by creating additional platforms of various shapes: cross-shaped, T-shaped, in the form of so-called dovetail, etc. Additional fastening elements can also be ledges, pins. They prevent the inlays from moving towards the missing wall.
When making odontopreparation for the inlay, it is necessary to know the anatomical and topographic features of the pulp (safety zones according to Abolmasov's classification).
In teeth with a removed pulp, a root canal can be used for inlays attachment, where a pin is inserted. The formation of cavities in pulpless teeth doesn't require such precautions as by working with teeth which have a living pulp.
The formation of the cavity for an inlay should be completed by smoothing the edges and walls using carborundum heads or paper discs. The edges are smoothed with finishers. Then the next stage of work – inlay modeling or taking an impression – starts.

FORMATION FEATURES OF THE CAVITIES OF DIFFERENT CLASSES IN PROSTHETICS WITH INLAYS

Formation features of class I cavities. When forming class I cavities, special care must be taken when approaching the medial and distal margin ridges. It is important that these functionally significant elevations remain intact. The angles formed by the medial and distal walls are also important for saving the margin ridges. If possible, tubers and connecting bridges should be saved too, since their excision weakens the tooth and can lead to chipping of the tuber, the wall, or the entire crown because of the chewing load.

It is necessary to avoid the formation of sharp corners of the walls and the bottom transition of the formed cavity. The bottom of the cavity should be created evenly flat and perpendicular to the walls. If the cavity is deep, an adhesive direct or indirect pulp capping or the use of a calcium hydroxide therapeutic pad, is needed to avoid the negative reaction from the pulp.

In case of a class I defect, the condition of the proximal contacts should be carefully examined before planning to make an inlay on one surface. If there is a suspicion that the tissues of the interproximal area are weakened by the carious process, a cavity for the OM/OD-inlay should be formed.

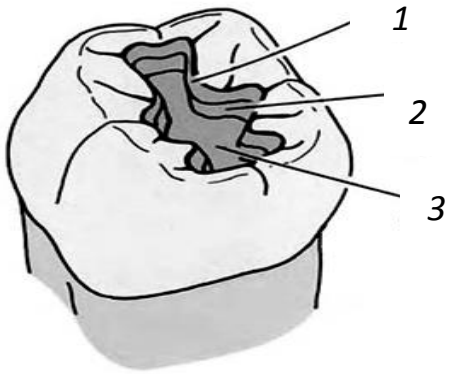


Fig. 5.1. Class I cavity:
1 — occlusal bevel; 2 — cavity walls; 3 — cavity bottom

Formation features of class II cavities. The initial stage is the formation of an occlusal segment (additional cavity), which is made according to the rules for the preparation of class I cavities.
When the formation of the occlusal segment is completed, the next step is to create the proximal cavity. The gingival wall of this cavity should be located below the contact point, while the contact with adjacent teeth is gone. The gingival wall of the cavity is located within the periodontal sulcus or just above the gingival margin. In most cases, the gingival wall should be at right angles to the long axis of the tooth. The buccal and lingual walls of the proximal cavity are formed the way that avoids contact with adjacent teeth.

Formation features of the cavities for complex MOD-restorations. If the largest part of the occlusal surface of a tooth is destroyed because of caries, defects in previous restorations or abrasion, the alternative is to make MOD-onlays or MOD-inlays instead of making crowns. Such restorations make it possible to save a large amount of hard tissues in the gingival area, and thus to minimize the negative impact of microprosthesis on the marginal periodontium.
For MOD-inlays, the main part of the preparation is carried out in the same way as for OD- inlays and OM-inlays on two surfaces. First, both proximal segments are formed, connecting them with an occlusal isthmus. To ensure the strength of the tooth, the width of the isthmus connecting the occlusal and approximal segments of the inlay should be at least 1/3 of the width of the tooth chewing surface.

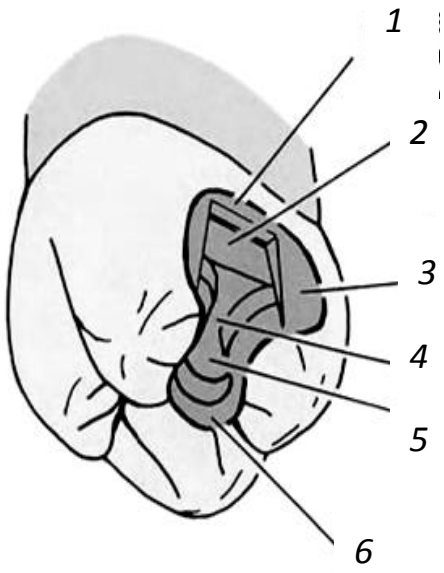


Fig. 5.2. Class II cavity:

1 — gingival bevel; 2 — proximal cavity; 3 — proximal walls; 4 — isthmus; 5 — cavity bottom; 6 — occlusal bevel

Formation features of class III cavities. The use of inlays for the restoration of class III defects according to Black's classification is significantly limited due to the high aesthetic requirements for restorations of anterior teeth. However, along with aesthetic direct restorations, depending on the specific clinical situation, ceramic and composite microprostheses can be used as well.

If the contact surface only is affected and there is no adjacent tooth, a cavity is made in the form of a triangle with the base facing the cement-enamel border, and the top faces the cutting edge. In the case of having the adjacent tooth, the cavity approaches a cube shape. Extensive destruction of the contact surface requires additional fixation and retention of the future restoration by preparing an additional cavity, which also involves the lingual surface. In these cases, the bottom of the cavity is prepared parallel to the enamel of the lingual surface of a tooth.

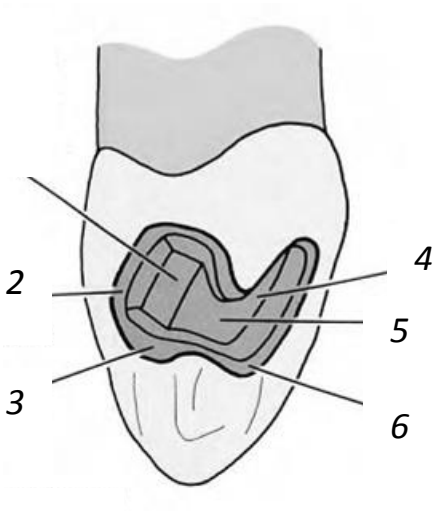


Fig. 5.3. Class III cavity:
1 — proximal cavity; 2 — vestibular bevel; 3 — proximal walls; 4 — cavity bottom; 5 — isthmus; 6 — lingual bevel

Formation features of class V cavities.

Basically, the boundary of class V cavities is determined by the presence of affected tissues of enamel and dentin.

In accordance with the safety zones and the topography of the pulp chamber, the bottom of the cavity is made convex, and the gingival and occlusal peripheral walls are mutually parallel. Usually, the margin of the restoration is placed within the sulcus or slightly above the gingival margin.

The fixation of class V cavities restorations can be improved by tunneling for additional retention pins followed by making pinlays.

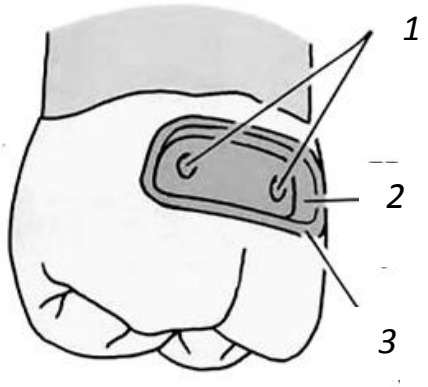


Fig. 5.4. Class V cavity:
1 — tunnels for the pins; 2 — peripheral walls; 3 — bevel

Formation of the wall bevels and final preparation of the formed cavities. By manufacturing cast metal inlays, it is necessary to form a certain bevel of the cavity walls along their outer edge. The bevel is needed for removing enamel prisms that are weakly supported in this area and for providing a better margin fit. If enamel with its weak support is not excised at the stage of cavity preparation, there is a risk of its chipping and formation of microdefects, which will lead to the occurrence of secondary caries at the restoration line. The bevel must be sufficiently pronounced, its width must be at least 1 mm.

Composite materials and ceramic masses are quite fragile, so the walls of the formed cavity must form right angles with the enamel surface, otherwise the edge of the restoration may be chipped. Restorations made from these materials have low edge strength in areas of their smallest thickness.

In the case, however, when metal alloys are chosen as the restoration material (optimally gold), the cavity edges may be beveled due to malleability, ductility and high strength of the alloys.

The final preparation of the edges and internal parts of the formed cavity is carried out with sharp hand tools (enamel knives and hatchets, chisels). These instruments are used by the finishing of proximal walls and edges, which should finally become smooth. Particular attention is paid to the outer boundaries of the cavity, which means they shouldn't have overhanging and uneven edges of the enamel. Careful finishing of the boundaries can significantly increase the congruence of the inlay and hard tissues of the cavity and improve the margin fit of the restoration.

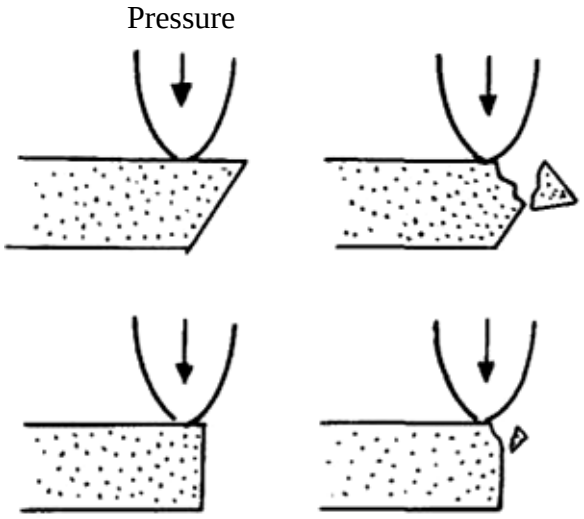


Fig. 5.5. Variants of incorrect bevel formation

GENERAL CLINICAL AND LABORATORY STAGES OF INLAY PRODUCTION

In the manufacture of microprostheses from various materials, clinical and laboratory stages can vary significantly both qualitatively and quantitatively, due to the peculiarities of the technological process. The basic clinical and laboratory stages are considered on the example of manufacturing a cast metal restoration in an indirect way.

Stages of making a cast metal restoration in an indirect way

Clinical stages	Laboratory stages
visit I	
– examination of the patient; – the choice of a rational method of prosthetics; – discussing the results of treatment with the patient; – the use of anesthesia; – isolation of the working area and salivation control; – if needed, retraction of the gingival margin; – cavity formation; – registration of occlusal relationships between jaws; – taking an impression of the working area; – taking an impression of antagonist teeth and casting an auxiliary model; – production of provisional restoration	– disinfection of impressions; – production of a working model; – casting models in the occluder/articulator; – preparation of the sample for inlay modeling; – modeling of the wax reproduction of the inlay; – casting an inlay using a wax reproduction in a foundry laboratory; – fitting of the inlay on the model and its preliminary processing
visit II	
– extraction of provisional restoration; - fitting of the inlay into the oral cavity; – correction of occlusal relationships;	– final (finishing) processing of the inlay

– fixation of the provisional restoration

visit III

– isolation of the working area and salivation control;
– extraction of provisional restoration;
– inlay fixation;
– removal of excess fixing material and polishing the restoration line; –
– reassessment of occlusal contacts and the edge adaptation of the inlay

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
3. Fitting of the inlay		
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.

Advantages of the direct method:

- higher manufacturing accuracy, since there is no need to take an impression and to make a working plaster model, which differ in volumetric changes of auxiliary materials;
- modeling of an inlay on the natural tooth in the oral cavity makes it possible to consider the functional occlusion;
- the ability to control the inlay boundaries not only along the edges of the cavity, but also in the area of the gingival margin, which is important for the prevention of traumatic periodontitis.

Disadvantages of the direct method:

- the patient gets tired, because the manipulation is quite long;
- the risk of the oral mucosa burns with a hot modeling tool or wax;
- the complexity of modeling the inlay in the interdental surface (cavities of classes II, III, IV according to Black's classification);
- irrational doctor's expenses by following technical procedure;
- the need for special theoretical and practical doctor's training on modeling, constant working with this complex clinical technique to maintain manual skills at a sufficiently high level;
- the need to re-model the inlay in the oral cavity in case of deformation during its removal or failed casting;
- the impossibility of pre-fitting the inlay on the working plaster model, which lengthens the time of its fitting in the oral cavity;
- the impossibility of using compensation methods for metal shrinkage during casting (selective coating of cavity walls and bottom with protective varnish on the model), and of providing free space for cement placement;
- dividing the process of obtaining inlay wax reproductions into several stages in case of a large number of prepared teeth.

Indirect method of making inlays.

A combined collapsible model is cast, on which the inlay is modeled.

The greatest accuracy of a metal inlay can be obtained by manufacturing it by casting on a refractory model. The technique for obtaining such a model is the following: In the cast, the wells of the abutment and adjacent teeth are separated by metal plates protruding above the level of the imprint by 2-3 mm. This area is filled with a refractory mixture, and after its hardening, the protruding part is lubricated with vaseline and the general part of a model is cast. After separation of the putty in the resulting model, the abutment teeth will consist of a refractory mixture, and the rest of the model will consist of ordinary dental plaster. Having modeled the main wax reproduction of the inlay in the tooth cavity and having placed sprues, the refractory block is separated from the plaster model. After molding into a cuvette, the wax reproduction of the inlay is replaced with metal.

Indications for the use of the indirect method: when having defects in the crowns of molars and premolars on the mesial and occlusal surfaces or mesial, occlusal and distal surfaces, Black's classes III, IV, by orthopedic treatment with inlays of adjacent teeth.

Advantages of the indirect method: saves doctor's and patient's time; have great accuracy, due to reducing shrinkage of the alloy during casting on refractory models.

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

Errors	Causes	Elimination methods and preventive measures
1	2	3
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.	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.

	The cavity is not hydrated. The pin is not hot enough.	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. During the formation of a flat bottom in class 5 cavity in tooth 21, carried out under infiltration anesthesia, the pulp chamber was opened. What is the reason of this medical error? Describe the methods of preventing this complication.
2. A patient 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?
3. When preparing tooth 36 for an inlay, a chipped tooth wall occurred. Give possible reasons. What measures should be taken to prevent these side-effects?
4. Patient S., 45 y. o., in tooth 47, a deep cavity of Black’s class 1 with parallel walls was formed. When fixing the cast inlay on the cement, the doctor couldn’t fully place the inlay in the cavity, so it

protruded above the level of the chewing surface. Give the reasons why it happened. What are your actions?

5. Patient M., 26 y. o., a symmetrical cavity of Black's class 1 in tooth 36 was formed. Give an assessment of possible complications? What are your actions?

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 6

Topic: Veneers, indications for application. Characteristics of modern construction materials. Methods of veneers fabrication. *Modelling of veneers on phantoms.*

Purpose of the lesson: to study the indications for the fabrication of veneers; to study the structural materials used for the fabrication of veneers, as well as the properties of the materials used and the requirements for them; to study the features of the methods of fabrication of veneers.

OBJECTIVES OF THE LESSON:

1. Learn to identify indications for veneers.
2. To consolidate knowledge of the main classifications of defects of dental crowns.
3. To be able to choose the design of dental prostheses to replace defects in the crowns of teeth.
4. To learn how to model veneers.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

In order to fully grasp the topic, the student should repeat:

1. Anatomical structure of jaws, teeth and periodontium.
2. Methods of examination of dental patients.
3. Carious and non-carious lesions of the crowns of teeth.
4. Morphological changes in the tooth and surrounding tissues in pulp inflammation.

CONTROL QUESTIONS FROM RELATED DISCIPLINES:

1. anatomical structure of the lower jaw.
2. anatomical structure of the upper jaw
3. Anatomical structure of teeth
4. Anatomical structure of the periodontium
5. Basic methods of anaesthesia in dentistry
6. Basic methods of examination of dental patients

CONTROL QUESTIONS:

1. Veneers. Indications for prosthetics with veneers.
2 Basic and auxiliary materials used in the fabrication of veneers. 3.
3. Methods of veneers fabrication. Characteristics of direct and indirect methods.
4. Modern structural materials for veneers fabrication.
5. Methods of fabrication of orthopaedic structures with the help of CEREC (CAD/CAM).

GENERAL PRINCIPLES OF VENEER PREPARATION

Veneers usually cover the front group of teeth (incisors and canines), rarely premolars. Although veneers can be thought of as half of a porcelain crown, the steps and principles of preparation for veneers differ significantly from those of a porcelain crown.

Given the importance of enamel for adhesion, enamel should be preserved wherever possible during tooth preparation, but this must be balanced against the amount of preparation required to create an aesthetically pleasing and durable restoration.

Veneers can also be fabricated on unprepared teeth, which requires extensive edge grinding of the enamel and most often results in restorations with enlarged contours.

Sufficient experience has been gained in the clinical application of veneers. The full function of the restorations depends on the quality of the examination, the choice of treatment method, the correct preparation and the quality of the technical execution of the work.

Veneer (Laminate) is a porcelain (ceramic) or composite plate that replaces the vestibular surface of a tooth. The full name of the method is veneer porcelain.

Veneers are used to partially correct or completely correct the broken shape or colour of teeth. Veneers are made in accordance with the patient's ideas about the aesthetics of the smile (taking into account the anatomical shape of the tooth to be restored and its position in the dental arch, the colour of neighbouring teeth and antagonist teeth). Veneers can be used to give the tooth a perfect shape and accurately reproduce the required colour.

Veneers are representatives of high technology in dentistry. In clinical practice we distinguish between direct and indirect veneers.

Direct veneers are made directly on the teeth in the patient's mouth. The material for direct veneers is composite. Most often light-curing composite material is used.

Indirect veneers - are made by indirect method, in a dental laboratory. Most often indirect veneers are ceramic (porcelain) restorative veneers (plates).

Indications for veneers.

- discoloured teeth that cannot be corrected by whitening methods (enamel spots, age-related discolouration, pigmented enamel cracks, fluorosis, tetracycline teeth, etc.);
- altered tooth shape (trauma, wedge-shaped defects, erasure, teeth with abnormal enamel development (amelogenesis imperfecta, enamel hypoplasia), teeth with abnormal shape development (spiky teeth), etc.);
- rotations of teeth around their axis and their inclinations (not pronounced);
- gingival smile (alignment, increase in the height of the clinical crown of the tooth);
- presence of trems and diastemas;
- the need to correct the aesthetics of the anterior part of the dentition by changing the anatomical shape of the crowns of individual teeth (in the case of adentia or retention).
- the presence of multiple, small, discoloured fillings.

Contraindications for veneers (or situations where veneers are undesirable).

The fabrication of veneers is contraindicated or undesirable if the patient's dentoalveolar system is functionally deficient. Prosthetics for missing teeth in the lateral areas, or restoring their chewing efficiency, should be the dentist's priority. The rule is quite simple - function must be restored before aesthetics.

There are no clear contraindications to direct composite veneers. Direct veneers can be made on almost any tooth, even if it is 1/2 made up of restorative filling material.

Indirect, ceramic veneers cannot be used when:

- advanced dental caries and periodontal disease;
- with significant enamel defects or significant enamel abrasion, grinding;
- with significant defects of the crown of the tooth (destruction of more than 1/2 of its size);
- parafunction of the masticatory muscles (bruxism);
- if you are allergic to the materials and components used for direct tooth restoration

Direct veneers.

The technique of fabrication of direct composite veneers involves grinding off the vestibular surface of the crown of the tooth, approximately 0.3 - 0.5 mm, and the subsequent restoration of its aesthetics by applying composite material layer by layer in the required volume. For the high-quality fabrication of direct composite veneers, the step of grinding down the tooth to be restored is necessary. Without grinding, the restored tooth will look bulging and the crown colour will be matt and unnatural. It is preferable to keep the boundaries of the grinding within the tooth enamel. The rules for the

fabrication of direct veneers are similar to those for direct restorations and include the use of a cofferdam.

For the fabrication of direct veneers, the same filling materials are used as for fillings in the treatment of tooth decay. The selection criteria of modern materials are mostly based on the preferences of dentists developed in the process of work. The quality of the restorative material for direct veneers should ensure easy layer-by-layer application, good polishability and colour stability (hybrid, mini-filled composites and nanocomposites).

Advantages of composite veneers:

- speed of achieving the final result of treatment (result in one visit);
- price (composite veneers are cheaper than ceramic veneers).
- Disadvantages of composite veneers:
- brittleness;
- increased erasability;
- swelling of composite in a humid environment;
- the need for periodic polishing due to loss of lustre.
- The service life of composite veneers averages 3 - 8 years and depends on:
- the patient's level of oral hygiene;
- the functional load on the tooth restored by the veneer.

Veneers can be fabricated on unprepared teeth, whereby the crown enamel must be at least superficially ground, but the final result of the restoration will have enlarged contours. This tactic is justified when it is necessary to increase the size of the crowns of teeth (presence of cusps, diastemas, etc.).

Indirect veneers.

Indirect (ceramic) veneers have a number of advantages over composite veneers:

- excellent aesthetics (colour stability, permanent shine);
- stability of shape (low erasability);
- bioinertness;
- relatively easy hygienic maintenance due to the perfectly smooth surface;
- resistance to food colouring;
- long service life.
- Among the disadvantages of ceramic veneers are:
- cost;
- low repair effect in case of chipping (breakage) of a veneer part;
- long manufacturing time (compared to composite veneers).

Fabrication of an indirect veneer in the laboratory requires several patient visits and can take about one week. The prepared teeth may be covered with temporary veneers until the final fabrication and placement of the permanent veneers. This is decided on a case-by-case basis by the doctor and the patient. The depth and volume of the prepared hard tissues, the number of prepared teeth, the need to pay for temporary veneers, etc.) may influence the decision. An indirect porcelain veneer can be fabricated in one visit by computer-aided modelling and milling (CEREC). If CAD/CAM equipment is available, the veneer is sawn from a ceramic block.

Ceramic veneers are made by:

- by the layering method;
- by pressing a blank with subsequent colouring;
- by milling of the workpiece with subsequent colouring.

SITUATIONAL TASKS

1. Patient A. has discoloured teeth due to fluorosis. Suggest options for correcting the aesthetics.
2. When fitting a veneer made on tooth 21, its vestibular surface chipped off. Explain the causes of the complication. Determine the further treatment plan.
3. When preparing the crown of tooth 11 for a veneer, the doctor ground off the contact point that was not destroyed. Give an assessment.
4. When preparing tooth 13, the doctor formed a palatal ledge in the middle of the crown of the tooth. Give an estimate.
5. When preparing the crown of tooth 21 for a veneer, the doctor formed a vestibular ledge 0.5 mm below the gingiva. Give an assessment.

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 7

Topic: Preparation of teeth and clinical and laboratory stages of veneer fabrication. Modern materials and methods of veneers fixation. *Preparation of teeth for veneers on phantoms.*

Purpose of the lesson To teach students the correct choice of tools and equipment necessary for the fabrication of veneers; to teach how to prepare the tooth surface for veneers and fabricate veneers by direct and indirect methods.

OBJECTIVES OF THE LESSON:

1. To familiarise with the different modes of preparation of dental hard tissues in the formation of the surface for veneer fabrication.
2. To master the practical skills of selecting abrasive tools for tooth preparation for veneers.
3. To learn how to prepare teeth for veneer fabrication
4. To learn how to fit and fix veneers.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

In order to fully grasp the topic, the student should repeat:
1. anatomical structure of jaws and teeth.
2. Methods of examination of dental patients.
3. Morphological changes in the tooth and surrounding tissues during pulp inflammation. 3.
4. Characteristics of the materials used for the fabrication of inlays.

CONTROL QUESTIONS FROM RELATED DISCIPLINES:

1. anatomical structure of the lower jaw.
2. anatomical structure of the upper jaw
3. anatomical structure of teeth
4. basic methods of anaesthesia in dentistry
5. Physical and mechanical characteristics of modern aesthetic dental materials
6. Basic methods of examination of dental patients

CONTROL QUESTIONS

1. stages and instrumentation of odontopreparation for veneers.
2. Criteria for assessing the quality of tooth preparation for veneers. 3.
3 Peculiarities of obtaining impressions for the fabrication of veneers.
4. Clinical and laboratory stages of veneers fabrication.
5. Modern materials for fixation of veneers and their characteristics.
6. Errors and complications in prosthetics of crown defects with veneers.

Odontopreparation should be considered as a surgical (operative) stage of irretrievable excision of dental hard tissues: necrotic, pathologically altered and healthy (to create the necessary shape and size of the cavity for retention).

In this regard, the principle of gentle grinding of tooth tissues and the generally accepted rules of asepsis, antisepsis, barrier protection of the doctor and the patient must be observed:
 use only sterile handpieces and burrs;
 disposable cups, bibs, saliva ejectors, water-air spray tips (spouts), headrest covers;
 use of water coolers, saliva ejectors, hoovers;
 work of the doctor and assistant wearing masks, gloves, goggles.
Used instruments should be adequately disinfected to prevent cross-infection.

Stages and criteria of odontopreparation for veneers

Preparation step	Criterion for assessing quality
1. Marking the depth of preparation of the vestibular surface; 2. Grinding of the vestibular surface with simultaneous formation of the vestibular scarp; 3. Formation of a ledge on the proximal surface; 4. Preparation of the contact surfaces; 5. Grinding of the cutting edge; 6. Finalising the ledge and smoothing the sharp edges;	1. The depth of the orientation grooves made with burs-markers in two planes is 0.3-0.5 mm; 2. Grinding in two planes, formation of a ledge above the gingival margin and parallel to its contour; 3. groove-shaped ledge above the gingival level 4. Preservation of contact points; 5. Grinding off the incisal edge by 1.0-1.5 mm; 0.5 mm wide groove from the palatal surface; 6. All transitions are rounded;

Typical mistakes and complications when preparing for veneers

Preparation step	Errors	Complications
Marking of the preparation depth of the vestibular surface	Insufficient depth of preparation	Excessive contours of the restoration, protrusion from the dental arch, unsatisfactory aesthetics in discoloured teeth
	Excessive depth of preparation	Dentine exposure, marginal microleakage, uncementation
Sanding of the vestibular surface	Single-plane preparation	Opening of the pulp cavity
Primary scarp formation	Sub-gingival location of the ledge	Unsatisfactory adhesive fixation, caries development, uncementation
Primary ledge formation	Insufficient width of the ledge	Excessive contours of the restoration
	Excessive width of the ledge	Dentine exposure, marginal microleakage, uncementation
Formation of a scarp on the proximal surface	Sub-gingival location of the ledge	Unsatisfactory adhesive fixation, caries development, uncementation
	Edge preparation of the shoulder	Chipping of ceramics, enamel with caries development, uncementation
Preparation of the contact surfaces	Damage to the adjacent teeth	Development of caries in adjacent teeth
	Location of the preparation boundary in the field of view	Unsatisfactory aesthetics
Grinding of the cutting edge	Excessive preparation	Uncementation, fracture of veneer (tooth)
	Insufficient preparation	Chipping of the veneer, unsatisfactory aesthetics
	Location of the preparation border in the occlusal contact zone	Chipped ceramic, split veneer
Final shaping of the ledge	Uneven ledge	Stresses in ceramics, chipping
Smoothing of edges	Sharp edges	Ceramic chipping

Prevention of complications during odontopreparation

During odontopreparation there are a number of factors that can cause both local and general complications. And there are factors that are dangerous for both the patient and the doctor. General

factors for the patient include: fear (stress), pain, risk of allergic reactions. Common factors for the physician include stress, infected aerosol cloud, difficult working conditions.

Local damaging factors in odontopreparation of vital teeth include: mechanical trauma, hyperthermia, drying, vibration and microbial invasion. These can lead to the development of both early and delayed complications:

- postoperative sensitivity;
- pulp dissection;
- acute and chronic pulpitis;
- secondary caries;
- gingivitis, marginal periodontitis.

To prevent the development of these complications, it is necessary to observe the following rules of preparation of vital teeth:

- Preparation should be carried out intermittently, under full air-water cooling (50 ml/min). The temperature of the water cooling must not exceed 35°C during tooth preparation.
- The preparation speeds for dentin and enamel must be observed.
- The anatomo-topographical features of the tooth to be prepared must be known.
- The depth of preparation should be monitored.
- The quality of removal of infected dentin must be monitored.
- When preparing in the anterior region, gingival retraction should be performed to avoid trauma to the gingival margin.
- After the preparation, the tooth cavity must be treated with dentine.
- When preparing in the maxillary area, gingival retraction must be performed to avoid trauma to the gingival margin.
- After preparation, the tooth cavity should be treated with desensitizer and sealed with a temporary filling.

It should be noted that after the preparation, temporary structures (veneers or crowns) should be made, which not only protect the prepared tooth from thermal, chemical, microbial and mechanical influences in the postoperative period, but also prevent the tooth from shifting, preserving the articulatory balance. Even a depulped tooth should be covered with a temporary crown, which fully restores the chewing function and also preserves the contours of the gingival margin for subsequent impression taking.

SITUATIONAL TASKS

1. Patient B., 22 years old, has persistent aching pain after preparation of vital tooth 22 for a veneer. Specify the causes. Your tactics.
2. When preparing tooth 11 for a veneer, the doctor ground off the cutting edge of the tooth by 2 mm, created a ledge in the vestibular vestibular surface, and on the palatal surface made a bevelling of the enamel. Indicate the mistakes made. What complications they may lead to.
3. After preparation of teeth 11, 12, 21, 22, impressions were taken with Zeta Plus and the cast model was scanned the next day. The veneers were milled using CEREC. When fitting the veneers in the oral cavity, it was found that they were 0.5 mm short of the cusp. Indicate possible errors. Your tactics.
4. After preparation of teeth 11;12;21;22 for veneers, the doctor received an impression with alginate impression mass. Give an assessment.
5. When fitting a veneer to tooth 11, a fracture occurred in the vestibular region from the vestibular surface. Specify the possible causes.

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 8

Subject: Metal stamped crowns. Clinical and laboratory procedures of manufacture.
Examination of the patient, determination of indications for the manufacture of metal stamped crowns.

Purpose of the lesson: To teach the definition of indications for the use of metal stamped crowns; to teach the rules of preparation of teeth hard tissues in the manufacture of metal crowns. To teach students the technique of taking impressions, single crowns fitting, the rules and sequence of fixing crowns.

OBJECTIVES OF THE LESSON:

1. Learn to examine the patient.
2. Learn to determine the indications for the manufacture of metal stamped crowns.
3. Learn how to prepare teeth for the manufacture of metal stamped crowns.
4. To consolidate the practical skills of taking alginate impressions.
5. Learn to fit and fix metal stamped crowns.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

1. Indications and contraindications for the stamped metal crowns manufacture.
2. Safety zones according to Abolmasov, Kluev. Principles and stages of tooth preparation for stamped metal crowns.
3. Methods of impressions taking, assessment of impression quality.
4. Technology of metal crowns manufacture, stamping techniques.
5. Rules of metal crowns fitting.
6. Rules and sequence of crowns fixation.

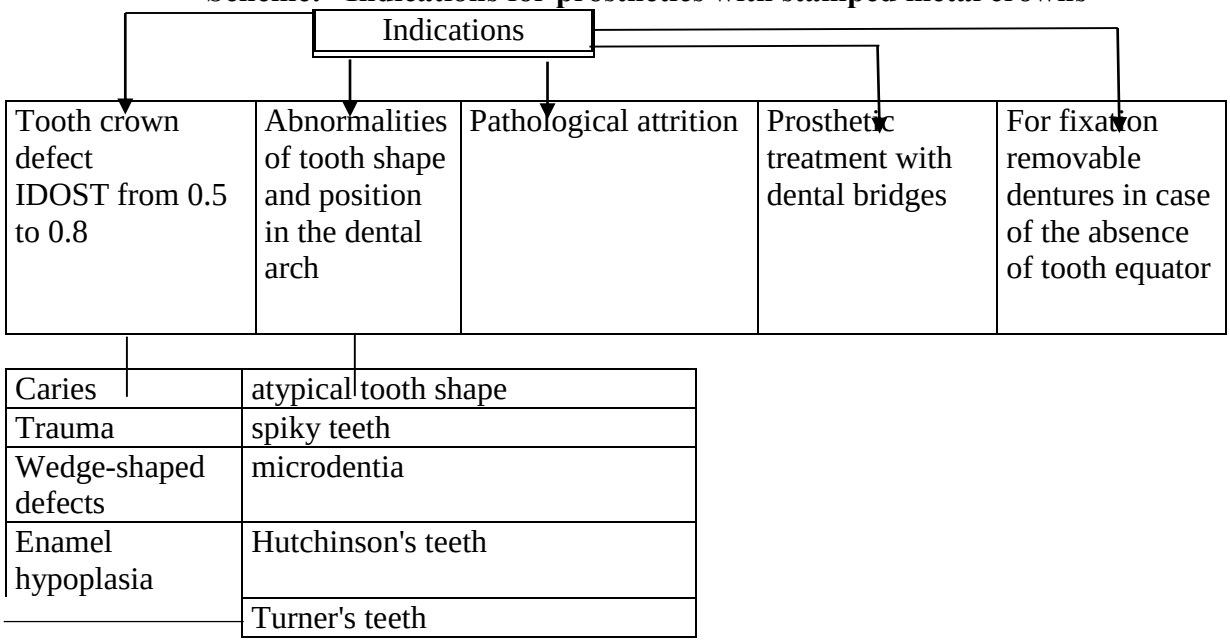
CONTROL QUESTIONS FROM RELATED DISCIPLINES:

1. Properties of metals used in stamped crowns.
2. Anatomy of the teeth of the upper jaw.
3. Anatomy of the teeth of the lower jaw.
4. Classification and properties of impression materials.
5. Classification and properties of plaster.
6. Physical and mechanical properties of rotary instruments.

CONTROL QUESTIONS:

1. Indications and contraindications for the manufacture of metal stamped crowns.
2. Clinical and laboratory stages of manufacturing a metal stamped crown.
3. Materials, instruments and equipment used for the manufacture of metal stamped crowns.
4. The sequence of teeth preparation for a metal stamped crown. Tooth preparation quality control.
5. Requirements for a metal crown. Rules and sequence of metal crowns fixation.
6. Prosthetic mistakes and complications with metal stamped crown.

Scheme: "Indications for prosthetics with stamped metal crowns"

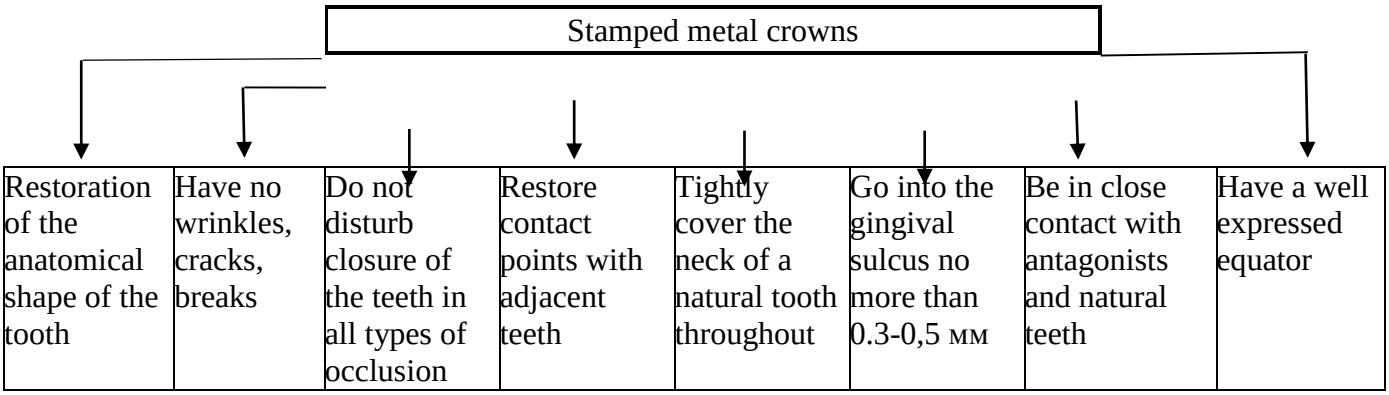


IBA scheme on the topic: "Rules for the preparation of hard dental tissues"

Action steps	Material equipment	Criteria and forms of self-control
1	2	3
Seat the patient in dental chair	Instruments for examining the patient,	The preparation of teeth is carried out according to the ergonomics
Tooth preparation		It is necessary that the hand holding the handpiece of the drill with an abrasive tool should be stable for confident preparation of the crown of the tooth. Stability was achieved by holding the handpiece in the right hand with three fingers, while the hand with the handpiece is fixed on the dentition or chin, depending on which jaw we perform the tooth preparation manipulation. With a dental mirror, holding it in the left hand, the cheek soft tissues are moved away (when preparing other groups of teeth, lips, oral cavity floor are protected with a dental mirror)
Separation of the medial and distal surfaces of the tooth	Separating disk, diamond, unilateral. Boron turbine diamond, peak - shaped.	The cheek tissues are moved away with a dental mirror, having previously checked the abrasive tool - its fastening on the disc holder and the handpiece. The preparation begins with the separation of the proximal walls of the tooth crown, so that the contact sides of the crown become parallel. Separation should be carried out smoothly, clearly, intermittently, with a separation disc, or a fine turbine bur. When working with separation discs, special care must be taken not to injure soft tissues, gums, and tongue.

Preparation of the vestibular and oral surfaces of the tooth crown.	Diamond turbine bur, cylinder or cone.	The preparation of the vestibular and oral surfaces of the tooth begins with the most protruding areas. The thickness of the layer to be removed depends on the shape of the tooth. Removal of hard tissues from all sides of the crown is carried out in such a way that its diameter is equal to the neck of the tooth. The prepared tooth should have a smooth surface.
Preparation of the occlusial surface or cutting edge of the tooth.	Diamond turbine bur, flame-shaped or rhomboid -shaped.	A uniform layer of tissue is removed from the occlusial surface to the thickness of a metal stamped crown 0,3 мм, while maintaining the anatomical shape of the occlusial surface of the tooth (cusps and fissures from posterior teeth, medial and distal angles at the front teeth). Preparation of the occlusial surface of the tooth should be done with smooth, clear, intermittent movements, cooling the diamond burs so that there is no overheating of the tooth tissues and the instrument. Hard tissues should be spared and not removed more than necessary for proper crown positioning. Diamond burs must be selected according to the size of the tooth, so as not to damage the adjacent teeth, tongue, mucosa of the cheeks and lips, the floor of the oral cavity or the hard palate during preparation. Occlusal separation is checked using articulating paper or a strip of heated wax. The paper is placed between the prepared tooth and its antagonists and the patient is asked to bite it. From the impressions on the wax it is easy to judge the degree of disunity achieved.
Finishing of tooth preparation	Diamond turbine bur, cylinder.	After the preparation of the tooth for a stamped crown, the tooth stump should have cylindrical shape.

Scheme: "Requirements for a stamped metal crown"



Crown fitting method

The technique of fitting crowns consists of :

- External examination of the crown
- Quality control of the correctness of the prepared tooth
- Determination of contact with antagonist teeth and adjacent teeth
- Determine the conformity of the relief of the edge of the artificial crown with the relief and the level of the gingival sulcus.
- Determination of the accuracy of the adjacent edge of the artificial crown to the tooth tissues.

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	

IBA scheme on the topic: "Rules and sequence for fixation a metal crown "

Steps	Material equipment	Manipulation
Crown processing	Crown, cotton, tools, alcohol	Degreasing the crown with alcohol and air drying.
Fixing material preparation	Crown, spatula, glass, cement for fixation	Apply a portion of liquid and powder to a glass plate. Isolate the tooth with cotton rolls.
Tooth stump processing	Dental unit, alcohol, cotton rolls, 3% hydrogen peroxide solution	Treat the tooth with a 3% solution of hydrogen peroxide, alcohol, warm air.
Mixing of cement mass	Crown, glass, cement, spatula	Cement powder is gradually added to the liquid and thoroughly rubbed to a creamy consistency. Fill the crown to 2/3 of the depth with cement.
Crown fixation		Put a crown on the tooth, ask the patient to tightly close the dentition. Carry out the closing of the teeth in the position of central occlusion.
Removal of residual cement. Recommendations to the patient		After the cement has hardened, the excess is removed with an excavator. The patient can eat after 2 hours

SITUATIONAL TASKS

1. Patient K. contacted the dentist with the complaints of the crown destruction of tooth 27. Objectively: Orthognatic bite. All teeth are intact, exceptfor tooth 27, which has a caries destructing part of vestibular, oral and distal surfaces. The tooth is changed incolour. The cavity isn't filled. Probing of the cavity isn't painful. The percussion isn't painful as well. The tooth is stable, without pathologic mobility. The crown and the root ratio is 1:2.

What is the dentist's tactics? What are the contraindications for the dental treatment of this patient with a crown at the moment? What are indications for the crown making for this patient? Which crown constructions do you know? What crown construction should be preferably used for this patient?

2. The patient A. complains of bad fixation of fillings in teeth 36, 37.
During the oral cavity examination you can see big fillings in teeth 36, 37 (IDOST= 0.6) , the walls of cavities are very thin. Percussion and probing aren't painful. Inlays cannot be used for tooth reconstruction in this case. The patient has problems with the cardiovascular system.

Put the diagnosis? What is your plan of treatment and methods of anesthesia for this patient?

3. One week ago the patient had metal crowns fixed on teeth 36, 37, 46, 47. The patient has complaints about the absence of contacts on frontal teeth and acute pain in teeth 36, 37, 46, 47 while chewing.

What is your diagnosis? What is your tactics of dental treatment for the patient?

4. After the tooth preparation for a metal crown during examination you can see an obvious equator of the tooth on its oral side. The chewing surface of the teeth is even.

What mistakes were made during the tooth preparation in this case? What are your actions to correct the mistakes?

5. The tooth, prepared for a metal stamped crown, has disocclusion on its chewing surface. The crown height of this tooth was shortened by 1/3 and its medial surface and prepared at the angle of 70°.

What mistakes were made in this caseand what are the complications? What is your tactics of the treatment?

6. At the same time (in one visit) the preparation of vital teeth 16.14, 25.27 for metal crowns should be done.

What kind of anesthesia is indicated in these conditions?

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 9

Subject: Plastic crowns. Clinical and laboratory stages of manufacturing.
Examination of the patient, determination of indications for the manufacture of plastic crowns.

Purpose of the lesson: to study the indications for the use of plastic crowns and the clinical and laboratory stages of their manufacture. To teach students how to prepare teeth and how to choose the tools and equipment needed to make a plastic crown.

OBJECTIVES OF THE LESSON:

1. To consolidate knowledge on the examination of patients with defects in the crowns of the teeth.
2. Learn to determine the indications for the manufacture of plastic crowns.
3. Learn how to prepare teeth for the manufacture of plastic crowns.
4. To consolidate practical skills in taking alginate impressions.
5. Learn to fit and fix plastic crowns.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE:

1. Abrasive instruments for tooth preparation.
2. Stages of taking an impression.
3. Classification of impression materials.

CONTROL QUESTIONS FROM RELATED DISCIPLINES:

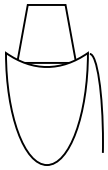
1. Anatomy of the teeth of the upper jaw.
2. Anatomy of the teeth of the lower jaw.
3. Classification and properties of impression materials.
4. Classification and properties of gypsum.
5. Physical and mechanical properties of rotary tools.
6. Physical and chemical properties and bioinertness of plastic materials.

CONTROL QUESTIONS:

1. Indications and contraindications for the manufacture of a plastic crown.
2. Clinical and laboratory stages of manufacturing a plastic crown.
3. Characteristics of the materials used for the manufacture of plastic crowns.
4. Methods for preparing teeth for a plastic crown.
5. Indications for the manufacture of self-hardening plastic crowns, manufacturing methods.
6. Mistakes and complications in prosthetics with a plastic crown.

A tooth stump prepared for a plastic (composite, acrylic) crown should be in the form of a cylinder or cone with a wall convergence of up to 5°. The thickness of the plastic crown is 1.5 - 2 mm and is determined by the properties of the material (low strength, wear, discoloration of the tooth tissues). A supragingival or gum-level shoulder is created that is shaped like a trough to minimize contact of the acrylic with the marginal gingiva.

Scheme on the topic: "Preparation for a plastic crown"

Crown	Stump shape	Thickness of tooth reduction	Shoulder
Plastic	cone  Convergence – up to 5°	1,5 – 2 mm	Without shoulder, Shoulder **90°** or gutter shaped, supragingival, or at gum level 

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.

Laboratory

Clinical and laboratory stages of manufacturing.

- ***Clinical stage (1st visit):***
- examination of the patient, diagnosis, determination of the treatment plan, choice of prosthesis design;
- anesthesia of hard tissues of the tooth (if necessary);
- tooth preparation, taking impressions (working two-layer and auxiliary), determining the central occlusion of the jaws and the color of the plastic.

Laboratory stage:

- production of gypsum models (working and auxiliary) from hard varieties of gypsum (marble, supergypsum, etc.), their positioning in the position of central occlusion according to certain characteristics, mounting into an occluder or articulator; cutting the gingival margin on the working model to its deepest imprint in the gingival sulcus;
- Modeling anatomical shape with colorless wax. The wax reproduction of the future artificial crown is made enlarged in terms of the finish of the plastic after polymerization, while restoring close contact with the antagonists and adjacent teeth;замена воска на пластмассу (полимеризация пластмассы);
- finishing, grinding and polishing after polymerization.

Clinical stage second2 visit): - fitting of the crown in the oral cavity, checking the occlusal relationships, assessing the anatomical shape and color of the crown.

Laboratory stage:- final processing of the crown (grinding and polishing).

Clinical stage third visit): - fixation of the crown in the oral cavity with cement.

SITUATIONAL TASKS

1. The patient complained of an aesthetic defect. Objectively: teeth 11,21,22 have plastic crowns that protrude sharply in relation to adjacent teeth.

What's wrong? What is your treatment plan?

2. When fitting an artificial plastic crown on tooth 12, an increasing of bite was found on central occlusion. What is your tactic?

3. When examining a plastic crown, its discrepancy with the anatomical shape of the tooth was found. What is the doctor's strategy?

4. A plastic crown is fitted on tooth 22, the color of the crown matches the color of natural teeth. During fixing, a discrepancy in color was found.

Where is the mistake? Doctor's tactics in this situation?

5. Ваш диагноз? Составить план лечения. The patient complained about not nice shape of the central upper incisors. On examination: the crowns of the central incisors of the upper jaw are screwdriver-shaped with a semilunar notch along the cutting edge.

What is your diagnosis? Make a treatment plan.

6. The patient complained of an aesthetic defect due to the color of the artificial crown of tooth 21, made 2.5 years earlier, a change in color was identified during the last six months. On examination: tooth 21 is covered with a plastic crown. In the gingival part of the crown, the darkening of the plastic crown is determined, hyperemia of the gums, soft and hard dental deposits are observed on all teeth. What is your tactic?

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.

2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 10

Subject: Combined crowns, clinical and laboratory stages of manufacturing.
Examination of the patient, determination of indications for the manufacture of combined crowns.

Purpose of the lesson: to teach students to determine the indications for the manufacture of combined crowns, to study the manufacturing methods and clinical and laboratory stages, to teach how to prepare teeth for different constructions.

OBJECTIVES OF THE LESSON:

1. Learn how to choose the design of the combined crown.
2. Learn how to prepare teeth for different constructions of combined crowns.
3. To consolidate the practical skills of taking impressions.
4. Learn how to fit and check the design of a combined crown.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

1. Rules and sequence of tooth preparation.
2. Safty zones according to Abolmasov, Klyuev.
3. Preparation of the oral cavity for prosthetics.

CONTROL QUESTIONS FROM RELATED DISCIPLINES

1. Anatomy of the teeth of the upper jaw
2. Anatomy of the teeth of the lower jaw.
3. Classification and properties of gypsum.
4. Physical and mechanical properties of rotary tools.
5. Physical and chemical properties and bioinertness of plastic materials.

CONTROL QUESTIONS:

1. Indications and contraindications for the manufacture of combined crowns.
2. Varieties of combined crowns
3. Requirements for abutment teeth for combined crowns.
4. Clinical and laboratory stages of manufacturing combined crowns according to Belkin, according to Borodyuk, according to Velichko.
5. Mistakes and possible complications in prosthetics with combined crowns.

Clinical and laboratory stages in the manufacture of a metal stamped crown with plastic veneer according to Belkin

Crown according to Ya.I. Belkin is a stamped crown with a plastic lining on the vestibular surface, mechanically fixed by dovetail cutouts along the edges of the sawn vestibular wall.

1st clinical stage. Examination, tooth preparation (as for a stamped crown), taking impressions (working and auxiliary), determining central occlusion.

1st laboratory stage. Casting of models (from ordinary plaster), mounting in an occluder. Modeling (like a stamped crown, but the vestibular surface is not modeled). Production of plaster and metal stamps, metal crown stamping.

2nd clinical stage. Fitting of a metal crown. Additional preparation of the tooth. Removal of an impression from the stump of the tooth with a crown with wax and plaster from the entire dentition.

2nd laboratory stage. Casting of a model with a crown. Whitening, mechanical processing and polishing of the crown. Removal of the vestibular wall of the crown, creation of retention points along the edges of the "window". Modeling of the vestibular surface of a wax crown with its replacement with plastic. Final processing of the crown after plastic polymerization (grinding and polishing of the veneer).

3rd clinical stage. Fitting the finished crown and fixing it.

Combined crown according to N.D. Borodyuk

It is a combined metal-plastic crown (Fig. 10.1). It consists of a stamped cap on the stump of the tooth (1), a cast metal protector soldered to it, reproducing the oral and proximal surfaces of the tooth (3), with a shackle for fixing plastic, which goes from the cutting edge to the gingival edge of the cap (4), a plastic facet with vestibular surface (5). Cast elements in the design of the crown give it greater strength, which allows such crowns to be used as supports for soldered bridges on anterior teeth.

1st clinical stage. Examination, diagnosis, design choice, tooth preparation. The tooth is prepared from the oral and proximal surfaces as if for a stamped crown. From the vestibular surface, the tooth is prepared without a shoulder, but as many hard tissues as possible are removed, the surface is beveled to the oral side, which will allow modeling the lining of sufficient thickness without giving it an excessively "convex" appearance, 1.5–2 mm is removed from the cutting edge. Taking impressions (working and auxiliary).

1st laboratory stage. Model casting (from ordinary plaster). The anatomical shape is not modeled, the stump is only covered with a thin layer of wax. Production of plaster and metal stamps, metal cap stamping.

2nd clinical stage. Fitting of a metal cap. Taking an impression with a cap on the stump of the tooth from the dentition, determining and fixing the central occlusion.

2nd laboratory. Casting a model with a cap, fixing models in an occluder. Protection modeling. The incisal edge, part of the oral surface with a bow-shaped attachment for plastic ("second pole of retention") is modeled from wax. Replacing wax with metal and soldering the cast protection with a cap. Whitening, pretreatment.

3rd clinical. Checking the design of the framework of the prosthesis. Fitting. Obtaining an impression for modeling the lining. Determining the color of the lining.

3rd laboratory. Casting of the model with crown framework. In the gingival part of the stamped cap, a perforation is made on the vestibular surface using special forceps, and the perforated section of the cap (2) is retracted from the tooth surface in the form of a discontinuous peak ("first retention pole"). Mechanical processing, metal polishing. Modeling of the vestibular surface of a wax crown with its replacement with plastic. Final processing of the crown after plastic polymerization (grinding and polishing of the veneer).

4th clinical stage. Fitting the finished crown and fixing it.

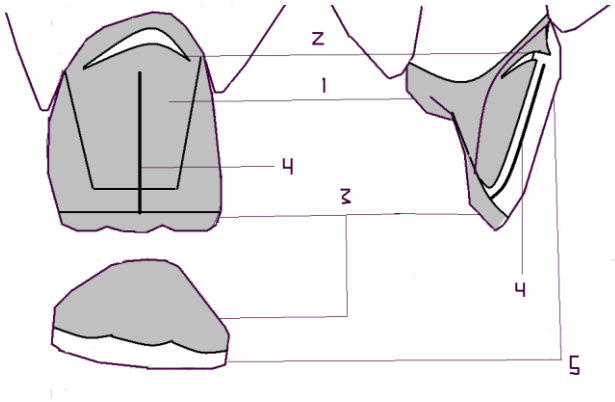


Fig. 10.1. **Combined crown according to N.D. Borodyuk**
1 - tooth stump, 2 - perforated cap area, 3 - proximal surface of the tooth, 4 - gingival margin of the cap, 5 - plastic facet from the vestibular surface.

Combined crown according to L.S. Velichko

It is a modification of the Borodyuk crown, which avoids some design flaws. It consists of the same structural elements - a stamped cap, a cast protector and a plastic facet.

Clinical stage.

Examination, diagnosis, design choice, tooth preparation, taking impressions. The teeth are first prepared as for a stamped crown with a plastic veneer, i.e. to a cylindrical shape with a diameter equal to the diameter of the neck, without creating shoulder, but from the vestibular surface, the tooth is prepared as deep as possible; after that, the cutting edge of the teeth is shortened by 1.5-2 mm, on the oral surface they are prepared with a shoulde from the cutting edge to the tubercle to a depth of 1 mm. The working impression is taken with an alginate mass or gypsum.

Laboratory stage. Casting of models, modeling. Production of stamps, stamping of a metal cap. The cap is prepared without restoring the anatomical shape.

Clinical stage. *Fitting of a metal cap. Taking an impression with a cap on the stump of the tooth from the dentition, determining the central occlusion.* The finished crown (cap) is fitted on the tooth. After making sure that the manufacturing and fitting are correct, the cap is removed from the tooth and a hole is cut out on the vestibular surface and its correspondence to the projection of the future arcuate attachment. After re-applying the cap on the tooth, impressions are taken for the casting of a working and auxiliary model, and the central occlusion is determined.

Laboratory stage. *Casting of a model with a cap, fixation in an occluder. Modeling of the protector, replacing wax with metal and soldering the molded protector with the cap*. In the occluder on the oral surface and the cutting edge of the crown, a protection is modeled from wax - a plate on the oral and lateral surfaces with a shackle for attaching the plastic from the cutting edge. The free end of the shackle is inserted into the hole on the vestibular surface of the crown and brought to touch with the stump plaster. The wax reproduction of the protection in the foundry laboratory is replaced with metal. The metal protector is fitted and soldered to the cap. After soldering, the framework of the metal crown is ground, polished and transferred to the clinic.

Clinical stage. *Design check*. Fitting of the structure in the oral cavity. The doctor fits the framework in the oral cavity. After checking the correctness of manufacturing, remove the framework and cut a hole on the vestibular surface of the cap. After that, the cap is filled with molten wax, the framework is applied to the tooth and an impression is made with plaster. Determine the color of the lining.

Laboratory stage. *Casting of the model with crown framework.* Mechanical processing and polishing of metal. Modeling of the vestibular surface of a crown with wax, replacing it with plastic, grinding and polishing the lining. On the model the technician models the vestibular surface of the crown from wax, replaces the wax with plastic of the corresponding color, grinds and polishes the finished facet.

Clinical stage. *Fitting and fixation.* After the final processing, the crown is transferred to the clinic, where the doctor does fitting and fixes it with cement.

SITUATIONAL TASKS

1. The patient complained of an aesthetic defect of the artificial crown of tooth 21. The crown was made 2.5 years earlier. The change in color was determined during the last six months. On examination: tooth 21 is covered with a combined crown with plastic lining. In the gingival part of the crown, a gray-blue darkening of the plastic lining is determined. There is hyperemia of the gums with a cyanotic tint on all teeth, soft and hard dental deposits. What is your tactic?

2. The patient came to the clinic complaining of a broken plastic lining in a combined crown made about 6 months earlier. Objectively: tooth 12 has a crown with traces of plastic lining. The cervical rim of the metal up to 0.5 mm wide is torn, thinned edges are defined, bent to the sides. What is wrong with the treatment? What is your treatment plan?

3. The patient complains of a poor anatomical shape of tooth 13. There is a pronounced psycho-emotional arousal of the patient, periodic involuntary contractions of the facial and masticatory muscles during a conversation. According to the patient, an artificial crown on tooth 13 was made 5 months ago due to an acute injury. When examining the oral cavity on tooth 13, a crown according to Belkin with a defect in the cutting edge and a chipped lining were revealed. The stump of tooth 13 is preserved at ½ - 2/3 of the height of the anatomical crown. A thick layer of fixing material is in the gap between the cutting edge and the crown. Percussion of the tooth is painless. Suggest a treatment plan. What type of prosthesis is indicated?

4. When checking the design of the combined crown on tooth 35, a part of the lining was chipped, exposing the metal frame. Name the possible causes of what happened and determine the further actions of the doctor.

5. At the stage of checking the design of the combined crowns according to Borodyuk on teeth 11 and 21, elements of the metal framework were revealed through the plastic lining. Name the possible causes and ways to eliminate them.

6. When checking the design of the MA crown 35, the plastic lining was chipped, exposing the metal framworke. What are the possible causes of what happened and determine the further actions of the doctor?

7 Patient O., aged 44, complained of fracture of the crown part of tooth 12. The tooth had previously been treated for complicated caries. On the X-ray, the canal is sealed loosely by 2/3 of the length, there is a 1 mm bone loss around the root apex. The bite is edge-to-edge. The remains of the crown part of the tooth protrude above the gum level by 1-2 mm. What is your tactic? What construction can be used in this case?

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 11

Subject: Clinical and laboratory stages of manufacturing solid-cast, metal-acrylic, PFM crowns. Features of the preparation of teeth and impressions taking.
Method of fitting, sitting and fixation of single crowns. Examination of the patient, determination of indications for the manufacture of solid-cast, metal-acrylic, PFM crowns.

Purpose of the lesson
To teach the technology of manufacturing solid-cast, metal-acrylic and PFM crowns at the clinical and laboratory stages.

LESSON OBJECTIVES:

1. To study the clinical and laboratory stages of manufacturing cast, MA, PFM crowns.
2. Learn how to prepare teeth for the manufacture of cast, MA, PFM crowns.
3. To teach students the right choice of tools and equipment necessary for the manufacture of cast, MA, PFM crowns.
4. To consolidate practical skills in taking silicone impressions.
5. Learn to fit and fix cast, MA, PFM crowns.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE:

1. Anatomical shape of teeth, occlusion and articulation.
2. Equipment and instruments necessary for safe preparation of teeth.
3. Ergonomics in prosthetic treatment of patients with defects of hard dental tissues.
4. Anesthesia methods. when preparing the teeth of the upper and lower jaws and retraction of the gums.
5. Materials used in the manufacture of cast, MA, PFM crowns
6. Errors possible in the manufacture of cast, MA, PFM crowns and methods for their correction.

CONTROL QUESTIONS ON THE TOPIC OF LESSON:

1. Cast, MA, PFM crowns. Their characteristics, indications and contraindications for manufacturing.
2. Principles of tooth preparation for cast, MA, PFM crowns
3. Clinical and laboratory stages of manufacturing cast, MA, PFM crowns.
4. Methods of gum retraction. Impression methods. Impression requirements.
5. Fitting of frameworks for MA and PFM crowns, fitting of fabricated crowns in the clinic
6. Fixation of crowns with a cast framework (temporary and permanent)
7. Errors in the manufacture of cast, MA, PFM crowns.

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:

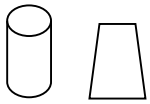
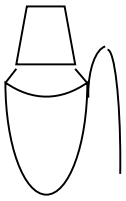
- casting of working and auxiliary models;
- models mounting in the articulator;
- modeling of frameworks with wax;
- replacement of wax with metal;

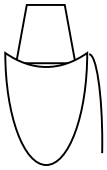
The second clinical stage:

- 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.

Scheme on the topic: "Preparation for crowns"

Crown	Stump shape	Redaction thickness	Shoulder
cast	Cylinder or cone  Convergence – up to 5°	0,5 mm	Not or SYMBOL OF SHOULDER 
PFM	Cone  Convergence - 5 – 7°	1,5 – 2 mm	SHOULDER: 90°, oblique, grooved, subgingival 

MA	Cone  Convergence - - 5 – 7°	2 – 2,3 mm	SHOULDER at gingival or supragingival level 

CASE STUDIES

1. During the fitting of cast crowns on teeth 17 and 27 before fixation, the absence of normal occlusal contacts with teeth 16, 26 and antagonist teeth was revealed. Name the possible causes of what happened and determine the further actions of the doctor.
2. At the stage of checking the design of MA crowns 11 and 21, elements of the metal framework were found to be visible through the plastic layer. Name the possible causes and ways to eliminate them.
3. When checking the design of the PFM crown 35, a part of the ceramic lining was chipped, exposing the metal framworke. Name the possible causes of what happened and determine the further actions of the doctor
4. When casting a collapsible model, the shoulders on the prepared teeth were not clearly displayed. The dental technician made crowns that did not reach the shoulders located in the region of the necks of the teeth in the oral cavity. Specify the mistakes made! What is the doctor's tactics?
5. Patient I., 34 years old, a teacher by profession, complained about an aesthetic defect of tooth 21. Objectively: the crown part of tooth 21 is changed in color, the tooth is stable, painless during percussion, there is a defective filling on the proximal and vestibular surfaces.There are no periapical changes on the X-ray. The bite is orthognathic. Make a diagnosis! Suggest a treatment plan!

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 12

Subject: Metal-free crowns. Characteristics of modern structural materials. Methods for the manufacture of metal-free crowns (milling, sintering, pressing).
Examination of the patient, determination of indications for the manufacture of metal-free crowns .

The purpose of the lesson: To teach students the technologies for manufacturing designs of all-ceramic crowns, the materials used for this.

OBJECTIVES OF THE LESSON:

1 . To study the main properties of metal-free prostheses, advantages and disadvantages.
2. Learn modern methods of manufacturing designs of metal-free crowns
3. To study the structural materials used for the manufacture of metal-free crowns.

QUESTIONS REQUIRED TO LEARN THE TOPIC :

1. Materials used for the manufacture of metal-free crowns.
2. Types of dental porcelain, basic properties.
3. Dental laboratory equipment used when working with dental porcelain.
4. Medical instruments used when working with dental porcelain.
5. Auxiliary materials used in the manufacture of metal-free prostheses.

CONTROL QUESTIONS:

1. All-ceramic (metal-free) crowns. Their characteristics, indications and contraindications for manufacturing.
2. Comparative characteristics of the main materials used for the manufacture of metal-free structures.
3. Technologies for the manufacture of sintered crowns.
4. Technologies for the manufacture of pressed all-ceramic crowns.
5. Technologies for the manufacture of milled metal-free crowns.
6. Technologies for the manufacture of composite metal-free crowns.

Types of metal-free structures.

Currently, there are two main areas of non-metal prosthetics: ceramic restorations and a system of the “composite + fiber frame” type.

Ceramic restorations . They are divided into all-ceramic (single-layer, made of one type of ceramic) and two-layer (contain a strong frame of structural ceramics, which is lined with aesthetic ceramics).

The main methods of manufacturing ceramic dentures include:

- sintering on a refractory model or on platinum foil;
- hot pressing on lost wax models;
- computer milling (CAD / CAM technology);
- combined method.

Composite + fiber frame systems .

Currently, fiberglass is widely used; ceramic fibers (sometimes they are also called fiberglass); polyethylene fibers.

The fibers gain strength by being impregnated with resin or flowable composites. Impregnation can be carried out either in the factory (pre-filled), or immediately before (during) use **.**

Filled fiberglass can be used to make intracanal pins. Unlike metal, they have some elasticity, which reduces the load on the supporting tissues of the tooth.

The ceramic fibers are filled with a composite before use, which can lead to lagging behind the base (tooth tissues).

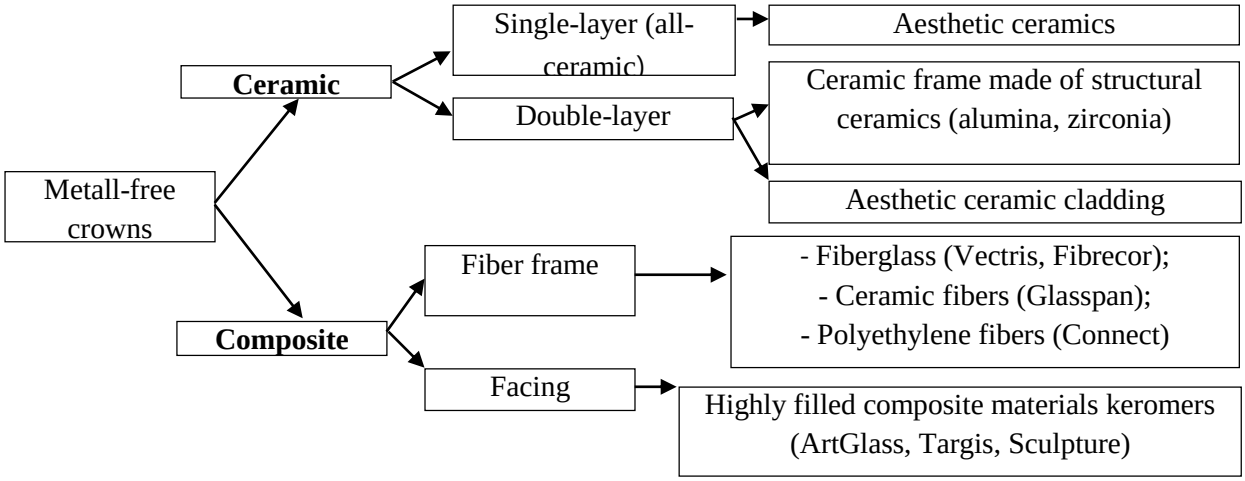
Polyethylene fibers filled with a composite outside of the factory usually have a strength that is not much higher than the strength of the composite without fiber.

All types of fibers are used for frameworks of bridges, crowns made from ceromers and composites; frames for splinting teeth; intraoral prosthetics (eg, Maryland bridge); intracanal pins.

Unlike metal, they are transparent and hypoallergenic (in most cases), which makes the restorations more natural.

Another area of metal-free prosthetics is keromers , materials in which ceramics act as a filler. They combine the best properties of porcelains and composites; have good aesthetics and are easy to work with (compared to porcelain). Curing is carried out by light and thermal (up to 200^{o} C) polymerization. They are used to produce veneers , inlays, onlays, crowns and bridges on a metal or fiber framework (all under technical laboratory conditions); easy to repair. The fiber framework of keromers has a transparency that preserves the natural optics of the tooth. In terms of abrasion , they are inferior to porcelain, but retain natural antagonistic teeth **.**

Varieties of metal-free crowns



Methods for making ceramic crowns

SITUATIONAL TASKS

1. Patient X., aged 35, complained of chipping of the cusp of crown 25, which was made about 7 months earlier from a fiberglass-reinforced composite. Objectively: a defect in the tubercle of artificial crown 25, the crown is fixed, the tooth is stable, percussion is painless, no pathological changes are detected on the radiograph of tooth 25. What are the possible causes of this complication? What is your tactic?

2. Patient K., 38 years old, complains about the incomplete color matching of a pressed ceramic crown made 3 weeks ago to replace a previously existing metal-ceramic restoration. Objectively: the artificial crown of tooth 12 corresponds in shape, but its difference in color from neighboring teeth is determined in the form of a grayer shade. On the dental x-ray, the fit of the crown along the neck is good, the root canal is sealed tightly throughout, there are no periapical changes, the pin of the metal

stump pin tab is located on 2/3 of the root canal. What are the possible causes of the complication? Suggest a way to fix the error.

3. Patient X., aged 35, complains of acute pain in tooth 12, which occurs spontaneously, aggravated by thermal stimuli, especially severe in the evening and at night, and associates this with the manufacture of an all-ceramic crown on the tooth, which began 2 days ago. Objectively: tooth 12 is prepared for an artificial crown, there is no provisional crown, the preparation depth is 2.0-2.5 mm, the shape of the stump is a truncated cone with a convergence of about 12 degrees, a subgingival ledge with a width of more than 1.0 mm is determined by probing. What errors of the orthopedist could lead to this complication? Doctor's tactics?

4. Patient O. came to the clinic with complaints of pain when biting on tooth 4.6. From the anamnesis: 2 years ago, an all-ceramic crown was made on tooth 4.6, the tooth had not been treated endodontically before. On the radiograph: A focus of bone tissue rarefaction in the region of the apex of the medial root, 2x1 mm in size. The crown of tooth 4.6 was trepanned and endodontically treated.

What material is preferable to close the burr hole?

5. Patient X., aged 28, complained of a violation of the aesthetics of the face due to dissatisfaction with the appearance of the metal-ceramic crown 12, made 5 years ago. Objectively: the shape of the face is not changed, gingival type of smile; crown 12 is in a satisfactory condition, when probing it is determined that the fit of the crown along the neck is not broken, the contact of the crown edge with the ledge at the level of the gum, the contour of the gum edge is not broken, the change in the color of the gum edge is determined due to the gray shade of the edge of the artificial crown. Suggest ways to help the patient.

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 13

Subject: Features of tooth preparation for the manufacture of metal-free crowns. impression materials. Methods for obtaining impressions. Digital impressions. Clinical and laboratory stages of manufacturing.
Obtaining impressions from alginate and silicone materials.

The purpose of the lesson: To teach students the clinical and laboratory stages of manufacturing designs of all-ceramic crowns, possible errors in their manufacture and ways to eliminate them.

OBJECTIVES OF THE LESSON:

1. To consolidate knowledge on the examination, diagnosis, choice of prosthesis design for patients with defects in the crowns of the teeth.
2. To learn the right choice of tools and equipment necessary for the manufacture of metal-free crowns, the method of preparing teeth for the manufacture of all-ceramic crown designs.
3. To consolidate practical skills in obtaining alginate and silicone impressions.
4. Learn how to prepare the surgical field for scanning, study the sequence of steps in the manufacture of an all-ceramic (single-layer) crown using CEREC technology in the "Database" modeling mode.
5. Learn how to fit and fix various designs of all-ceramic crowns.

QUESTIONS REQUIRED TO LEARN THE TOPIC:

1. Anatomical shape of the teeth of the upper and lower jaws.
2. Conditions for safe preparation of teeth.
3. Methods of anesthesia of the teeth of the upper and lower jaws in the manufacture of artificial crowns.
4. Auxiliary materials used in the manufacture of metal-free crowns.
5. Methods for fixing non-removable orthopedic structures.

CONTROL QUESTIONS:

1. Indications and contraindications for the use of various types of metal-free crowns.
2. Principles of tooth preparation for metal-free constructions.
3. Methods for obtaining an impression in the manufacture of all-ceramic crowns. print requirements.
4. digital impression technique. Preparing the oral cavity and models for scanning, the sequence of steps in the manufacture of an all-ceramic (single-layer) crown using CEREC technology in the "Database" modeling mode
5. Clinical and laboratory stages of manufacturing metal-free crowns of various types (sintering, milling, pressing).
6. Fitting and fixation of all-ceramic crowns.
7. Mistakes in the manufacture of metal-free crowns, ways to eliminate them.

OOD scheme on the topic: "Preparation for all-ceramic crowns"

Crown	Stump shape	Sanding thickness	ledge
Sintered/Pressed Ceramics	Cone Convergence - 5 – 7°	1.5 - 2 mm	JUDGE: straight, oblique, grooved, subgingival
Zirconia	Cone Convergence - 3 – 5°	0.5 - 1.5 mm	JOG from ledge symbol to straight at the gum level, depending on the volume

The sequence of steps in the manufacture of an all-ceramic (single-layer) crown using CEREC technology in the "Database" modeling mode

The fabrication of an all-ceramic crown includes the following steps:

- Clean the surface of the tooth with a toothpaste and brush.
- Determine the color of the restoration, anesthetize the tooth.
- To prepare a tooth for a ceramic crown, taking into account the following requirements:

– the minimum depth of preparation on the occlusal surface is 1.5 mm;
– the angle of inclination of all walls is 4–6º;
– creation of a circular gingival ledge 1.2 mm wide at an angle of 90–110º;
– lack of sharp edges and undercuts;
– final processing of the stump with a diamond bur with a grain size of not more than 20 microns.

- Obtain an optical impression of the prepared tooth and antagonists.
- Select the tooth number, type of restoration and modeling mode in the menu of the CEREC program.
- On the virtual model, draw separation lines with adjacent teeth and outline the working area of the antagonists.
- Outline the border of the ledge.
- Select the required morphology option in the tooth database.
- Edit the proposed crown.
- Check occlusal and proximal contacts.
- Preview the virtual design, if necessary, correct it.

- Primemill or CEREC MC XL grinding module. Start the grinding process, at the end of which remove the finished crown and separate it from the shank using a diamond tool.
- Check the color and shape of the finished crown in the patient's mouth, avoiding occlusion of the teeth.
- Glaze the crown according to the manufacturer's recommendations.
- Fix the finished crown on the stump of the tooth with composite cement using an adhesive technique with mandatory etching of the inner surface of the ceramic structure with 5% hydrofluoric acid and subsequent silanization.
- Remove excess cement. Check and, if necessary, correct the occlusion with a water-cooled diamond instrument.

Model preparation and scanning

Some rules for making a plaster model:

- The model must be completely collapsible (all teeth are removed).
- The teeth are cast from grade 4 supergyps with a minimum amount of plastic (since the model is scanned by light, plastic particles will create glare and interfere with the reading of information). Do not touch the scanned surface with your hands.
- The border of scanning on a stamp with a tooth processed under a crown is marked with a lead of a simple pencil. It should run just below the final preparation line (or finishing line).
- The stump of the tooth is not varnished.

Rules for optical scanning in the oral cavity.

To ensure uniform optical reflective properties, a finely dispersed contrast powder is applied to the dried area of the dentition.

During optical scanning, the tip of the intraoral scanner is positioned over the required area of the dentition under the following conditions:

- it is recommended to eliminate the illumination of the scanned area by directional light sources, such as a dental unit lamp;
- the tip of the scanner is installed in close proximity above the occlusal surface of the teeth, it should be oriented in the direction of the distally located teeth;
- center the image of the dentition in the mesiodistal direction;
- The image of the prepared tooth should be centered on the monitor screen. The appearance of shadows and undercut zones in the scanned area is unacceptable;
- to obtain a better optical impression, it is recommended to obtain several images of the prepared tooth at different viewing angles, differing from each other by no more than 20 degrees.

SITUATIONAL TASKS

1. Patient K., aged 28, complained about the violation of the aesthetics of tooth 12, restored with an artificial crown made of pressed ceramic about a week ago. Objectively: the artificial crown protrudes from the dentition vestibularly more than 0.5 mm relative to the neighboring teeth. What are the possible reasons for this situation? Your actions?

2 . During adhesive fixation of the all-ceramic crown, the crown was not treated with 5% hydrofluoric acid followed by silanization.

What can this error lead to?

3. After the preparation of teeth 4.6, 4.5, 4.4, impressions were obtained using alginate impression material, the next day the cast model was scanned. Zirconium crowns are milled with CEREC. When fitting the crowns in the oral cavity, it was found that they did not reach the ledge of 0.5 mm. Specify possible errors. your tactics.

4. While fitting the pressed ceramic crown during an occlusal correction performed by the clinician with a diamond handpiece grinding head, the crown split. What is the cause of the complication? What are the ways to prevent complications?

5. Patient K., aged 56, complained of a violation of facial aesthetics due to the appearance of tooth 12 restored with an artificial crown. According to the patient, the crown was made of zircon 2 weeks ago. The patient cannot clearly explain the reason for dissatisfaction with the appearance of the structure. Objectively: the crown 12 is fixed, the color of the construction corresponds to the color of the neighboring teeth, the anatomical shape of the crown made by the full-anatomy method corresponds to the average anatomical image from the library for milling, mamellons and perekymata are pronounced on the vestibular surface. Assess the situation. Your actions?

6. Patient K., aged 30, complained about a violation of the aesthetics of tooth 12, restored with an artificial crown made of pressed ceramics after fixing the crown due to a discrepancy between its color and the color of neighboring teeth. According to the patient, the color of the structure is different from the color that it had during fitting. What is the reason for such an error? Your actions?

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.

2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.

4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 14

Topic: Recovery pin structures. Indications for use. Requirements for the state of the root and its surrounding tissues.

Examination of the patient, determination of indications for the manufacture of various pin structures.

The purpose of the lesson: to teach students to determine the indications for the choice of pin structures in the treatment of defects in the hard tissues of the tooth.

OBJECTIVES OF THE LESSON:

1. To consolidate knowledge on the examination, diagnosis, choice of prosthesis design for patients with complete defects in the crowns of the teeth.
2. Familiarize yourself with various pin designs.
3. Learn how to prepare a stump and open root canals for various pin structures.

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE:

1. Causes of destruction of the tooth crown.
2. Clinical picture of a complete defect of the tooth crown.
3. Requirements for the state of the tooth root and its surrounding tissues.
4. Structural materials for pin structures.

CONTROL QUESTIONS FROM RELATED DISCIPLINES

To fully master the topic, the student must repeat:

1. Anatomy of the teeth of the upper jaw
2. Anatomy of the teeth of the lower jaw
3. The structure of the pulp chamber and root canals of the upper and lower jaws
4. Rotary Root Canal Instruments
5. Classification and properties of adhesive materials
6. Metal alloys used for the manufacture of pin structures
7. Holographic methods in dentistry as a way to detect internal stress.

CONTROL QUESTIONS ON THE TOPIC OF LESSONS:

1. What is a pin. Pin requirements. Classification of restorative pin structures.
2. Diagnosis and methods of examination of patients with defects in the crowns of the teeth. What defects of crowns of teeth are called complete.
3. Clinical classification of root posts.
4. Pin teeth, their variety, indications and contraindications for use.
5. Stump pin structures, their variety, indications and contraindications for use.

Restoration of the crown part of the tooth with pin structures is a preventive measure. Underestimation of the preventive importance of restoring the crown part of the tooth in the presence of the root (roots) of the tooth in everyday practice leads to unjustified removal of the root. Removal of a tooth or its roots causes the inevitable resorption of the interdental septa and a decrease in the functionality of the periodontium of adjacent teeth.

The destruction of the crown of the tooth in the vast majority of cases occurs as a result of caries, less often due to trauma. Significant or complete loss of the crown leads to the development of secondary caries due to insufficient treatment of the cavity during the initial visit. The use of low-quality filling material and the clinically unreasonable choice of a method for restoring the integrity of the crown lead to spalling and splitting of the crowns of the teeth.

Pathological abrasion, dysplasia and hereditary disorders of tooth development also lead to a significant loss of hard tissues of the tooth crown.

For effective treatment of the destroyed crown part of the tooth, various pin structures are successfully used, the most "ancient" of which are pin teeth.

Dental prostheses are called dental pin constructions, in which the pin ensures their functioning as part of the dentoalveolar system.

It should be distinguished:

- pin structures used to restore hard tooth tissues (restorative pin structures);
- pin structures used for splinting mobile teeth in periodontal diseases (frame-pin splints).

Restorative pin structures are used to restore the anatomical shape of a tooth in the absence of conditions for performing other known methods of replacing defects in its hard tissues. The pin is one of the main elements of the restorative pin design (pin denture) that allows you to fix it on the teeth with varying degrees of destruction of the crown part.

Restorative pin structures are divided into ***pin teeth***, ***stump pin structures*** and ***restorations on pins*.** The classification of restorative pin structures is presented in the form of a diagram in Figure 14.1.

Rice. 14.1. Classification scheme for restorative pin structures.

Restorative pin construction (RPS) is a non-removable orthopedic prosthesis for restoring a destroyed crown and partially root part of a tooth. The IHK consists of a pin, which is fixed by adhesion of the fixing material (passively) or due to mechanical retention (actively) to the hard tissues of the tooth, and an artificial supragingival part, which replaces or ensures the replacement of a defect in the natural tooth crown.

A pin tooth (SHZ) is a fixed prosthesis, which is an artificial tooth, consisting of a root part in the form of a pin fixed in the root canal of the tooth and a crown part that completely restores the defect of its destroyed natural crown.

In recent years, for the purpose of prosthetics of the destroyed crown part of the tooth, orthopedic practitioners prefer structures consisting of an artificial crown, which is attached to a stump connected to a pin. Especially popular in such clinical situations is the use of stump pin structures.

A stump pin structure (PSC) is a micro-prosthesis for creating conditions for a reliable connection of an artificial restorative (support-restorative) crown, or other covering structure, with a preserved tooth root.

In clinical practice, two variants of stump pin structures are used:

- Stump pin tabs.
- Pin stumps.

Stump pin inlay (KShV) is a non-removable micro-prosthesis designed for restoration of the tooth stump in the presence of various options (suitable for use) of its preserved supragingival part. KShV ensures the creation of the shape of the stump necessary for high-quality manufacturing and retention of the covering orthopedic structure on the restored tooth.

Pin stump (PKT) is a non-removable micro-prosthesis designed to securely connect the future artificial crown (cover structure) with the root of the tooth, the supragingival part of which is completely destroyed.

It is necessary to distinguish between the concepts of a stump pin tab and a pin stump, since there are differences in the conditions for planning and performing special clinical preparatory stages for their manufacture, which affect the effective functioning of structures.

We distinguish stump pin structures:

1. *One-piece* (the pin and stump parts of the structure are made as a single product, exactly according to a pre-made reproduction or matrix). The stump pin tab (KShV) or the pin stump (SHT) can be:

- cast from metal according to an individually modeled reproduction (for example, LKShV);
- made by precision milling according to a pre-made sample (structures made of zirconium oxide);
- all-ceramic stump pin structures (cast ceramics, IPSEMPRESS ceramics).

2. *Prefabricated* (*composite)* (parts of the structure are made of a homogeneous material, while at least one of them is made according to an individually modeled reproduction).

3. *Combined* (designs are formed in a direct way using standard root pins and restorative dental material).

Cast stump pin tab (LKShV) is a kind of stump pin tab, which is cast from metal according to an individually modeled reproduction. LKShV can be solid and prefabricated (composite).

, restorations on pins are quite widely used. Aesthetic restorations that replace a crown defect can be reinforced with root posts on depulped teeth. In some cases, an alternative to artificial crowns, in the treatment of vital teeth with carious lesions or fractures in the area of the cutting edge or tubercles, are restorations on parapulpal pins.

Restoration on pins is an aesthetic micro-prosthesis, made by direct or indirect method, to replace a defect in the crown of a tooth, fixed attachment to the tissues of which is provided by pins.

Restoration on root pins is an aesthetic micro-prosthesis that replaces a defect in the crown of a pulpless tooth, the reliability of attachment to which is ensured by the pin shank placed in the root canal.

Restoration on parapulpal pins is an aesthetic micro-prosthesis for replacing a defect in the crown of a vital tooth, the fixed attachment to the tissues of which is provided by pin elements placed in the thickest structures of the dentin, relative to the pulp chamber, the so-called anatomical safety zones.

Examination methods

The diagnostic process consists of a number of stages of purposeful activity of a doctor, closely related to each other and consists in identifying subjective and objective symptoms of a disease or pathological process.

Subjective symptoms are clarified as a result of a survey of the subject (anamnesis).

Identification of objective symptoms is achieved by various methods of polyclinic examination. These include:

1. *Physical methods:*

- physical examination and examination;
- examination and examination of the oral cavity;
- percussion method;

- sounding method;
- palpation;
- assessment of the state of the dentition;
- assessment of occlusal and articulation ratios of the dentition;
- assessment of the condition of the oral mucosa;
- examination of the jaw bones;
- examination of the temporomandibular joint;
- examination of the muscles of the head and neck.

2. *Laboratory and instrumental methods:*

- x-ray studies;
- electrodontometry;
- galvanometry;
- diagnostic models;
- mastication;
- rheographic studies;
- thermodiagnostics.

Complete defects of the crown part of the tooth include:

- the presence of the gingival part of the tooth crown, protruding above the level of the gingival margin up to 3 mm;
- the presence of hard tissues of the tooth at the level of the gingival margin;
- destruction of hard tissues of the tooth below the level of the gingival margin up to '/ 4 of the length of the root (with greater destruction, as a rule, removal of the tooth root is indicated).

Varieties of designs of pin teeth

A large number of designs of pin teeth are known, each of which has characteristic features and differs in the manufacturing technique.

By design, pin teeth are distinguished:

- According to Logan - a monolithic porcelain tooth connected directly to the pin.
- According to Richmond - root protection with a ring as a support.
- According to V.N. Kopeikin - a stamped steel cap as a root protector and a pin fitted along the root canal.
- According to L.V. Ilyina-Markosyan - the supporting part in the form of a cast insert (shock absorber).
- According to A.A. Akhmedov - a metal crown with a plastic lining and a pin.
- According to A.Ya. Katzu - root protector and half ring.
- According to N.A. The beam-pin tooth consists of a metal semi-cap with an open vestibular surface, an elastic pin and a plastic lining.
- According to ORTON - one-piece cast with a support tab.
- According to Davies - composite, consisting of a separate porcelain crown and pin, which are connected with cement.
- According to L.E. Shargorodsky, the root protective plate is modeled on a wax model after fitting the ring and pin along the root canal. Root protection is not stamped, it is cast together with a pin and a ring.

- According to Duvel - diatoric porcelain teeth, in which pins with a special washer are attached.
- According to V.N. Parshin - a metal ring, a pin and a ground standard tooth made of plastic.
- According to 3.P. Shirak - a standard plastic tooth and pin fitted. The mouths of the root canal are used to form a retainer tab. The pin with the tooth is welded with quick-hardening plastic.

Indications and contraindications for the use of pin teeth

Indications:

- Significant damage to the walls of the crown of the tooth, when it cannot be restored with an inlay, semi-crown, crown.
- As part of a prosthesis in the restoration of the dentition.
- To restore the dentition with pathological abrasion.
- With an abnormal arrangement of individual teeth.

The choice of designs of pin teeth depends on a number of anatomical and clinical data. A simplified pin tooth and a pin tooth with an inlay should be used to restore single-rooted teeth, if the tooth root is well stable, has sufficient thickness and length, its channels are well passable, and there is no pathological process in the cervical and apical parts of the tooth.

With a weakened root wall, at the entrance to its canal, as well as in cases where it is impossible to unseal the root canal to the required length for the pin, as a result of which the pin will be shortened if the thickness is less than 1 mm, pin teeth with an outer ring should be used to restore the crown of the tooth .

In all cases of using a pin tooth as a supporting part of the prosthesis, it should be designed with an outer ring. The ring provides better preservation of the root and more reliably protects the cement from resorption.

The destruction of the tooth root below the gum level, as a rule, is the reason for the removal of these roots, regardless of the state of the tissues and the patency of the canals. This is due to the fact that the fixation of the classic designs of pin teeth involves either covering the supragingival part of the root with a ring, or introducing so-called shock absorbers or supporting tabs into the thickness.

The root part of the tooth, when the root is broken below the gum level, under certain conditions, can be successfully restored using a stump pin structure covered with an artificial crown.

Contraindications:

- Deep destruction of the root of the tooth by caries.
- Root fracture.
- Root canal obstruction.
- Pronounced curvature of the root.
- Presence of gingival fistula and periapical changes.
- The apical foramen was not obturated.
- The length of the root is less than the height of the clinical crown.

Root requirements.

Unsuitable for prosthetics are the incisors of the lower jaw, which have thin, laterally flattened roots and, accordingly, narrow channels.

Prosthetics with pin teeth is possible if:

- the root is not affected by the carious process, it is well stable in the hole;
- the root canal is hermetically sealed throughout with a root filling;
- the root with a height of 1-2 mm above the gum level has a sufficient length (equal to or greater than the length of the future crown part of the tooth). The ideal ratio of the future artificial tooth crown and root is 1:2.

- the root canal does not have sharp curvatures and is well passable to the estimated length of the pin being made;
- the root walls are thick enough (for proper resistance to lateral pressure, the root walls at the entrance to the canal must be at least 2 mm thick);
- the circular ligament of the tooth is preserved;
- the tissues surrounding the root do not have pronounced inflammatory phenomena.

The root must be stable and prevail over the lever created by the crown of the tooth, otherwise the masticatory load leads to a functional overload of the periodontium and, as a result, loosening and loss of the tooth. Root tissues should be not affected by the carious process, of sufficient thickness and hardness. The walls of the root should be at least 2 mm thick at the entrance to the root canal and throughout its length, the tissues surrounding the root should not be affected by the inflammatory process. The root canal from the apex side should be 1/3 sealed. The preservation of the circular ligament of the tooth and the presence of hard tissues of its supragingival part are important, since this affects the choice of design.

Pin requirements

The pin mainly perceives and transmits masticatory pressure on the root walls, if it does not occur along the vertical axis of the crown, which occurs during occlusal movements of the lower jaw associated with chewing food. When prosthetics of a single-root tooth, the pin connects the crown to the root firmly enough if its length is equal to or greater than the crown. In this case, the pin must have sufficient thickness to resist lateral pressure on the crown during chewing.

It is established that the thickness of the pin should be at least 1-1.2 mm.

Since the root and its canal narrow towards the apex, the pin must repeat the anatomical shape of the root - have a wide base (at the entrance to the canal), gradually decrease in diameter from the moment the canal narrows and end with a point. In addition, the pin must be resistant to bending and have a shape that excludes the possibility of rotation around the longitudinal axis of the tooth. The last requirement is met by a trihedral or oval shape of the pin.

In recent years, for orthopedic treatment of teeth with a destroyed crown, standard root pin systems have been widely used. However, it should be remembered that with all the variety of designs of standard pins, ignoring the indications for their use is often the cause of negative treatment results.

The use of standard root pins allows one-session preparation of the root for the manufacture of an artificial crown. The modified clinical classification of root posts is presented as a diagram in Figure 14.2.

Rice. 14.2. Scheme of clinical classification of root posts.

The division of root pins into passive and active or anchor (an anchor in English is an anchor, and implies active mechanical retention) is of fundamental importance. There is another clinical classification of pins according to which they are divided according to their purpose:

- To restore the stump.
- To strengthen the tooth after endodontic treatment.

To strengthen the tooth after endodontic treatment, passively fixed pins are mainly used, which have only longitudinal or circular grooves for the release of excess cement, because. their task is only to reinforce the tooth.

To restore the stump of the tooth, active root pins are mainly used, because. in this case, a more reliable mechanical retention is needed.

In some cases, it is possible to restore the tooth stump using fiberglass pins and filling material, but the service life of such a design will not be optimal.

Fiberglass posts belong to the group of elastic root posts

Elastic root posts have well-defined indications for which they are indeed the best solution.

SITUATIONAL TASKS

1. Patient T., 31 years old, complained of breaking off the crown part of tooth 12. The tooth had previously been treated for complicated caries. On the R-gram, the canal is loosely sealed by 2/3 of the length, there is a 1 mm bone loss around the root apex. The bite is straight. The remains of the crown part of the tooth protrude above the gum by 1-2 mm.

What is your tactic? What orthopedic construction can be used in this case?

2. Patient B., aged 19, complained of acute pain in the area of tooth 21 after an injury. Mobility of a separate fragment of the tooth crown (filling and underlying hard tooth tissues) is noted, the rest of the crown is immobile. The R-gram shows a fracture of part of the crown and the oral wall of the root 1-2 mm above the neck of the tooth. EDI 20 mA, the root canal is not sealed, orthognathic bite.

What are the contraindications to the use of pin teeth in this patient (relative and absolute)?

3. Patient S., aged 25, complained of an aesthetic defect caused by a fracture of the crown part of tooth 12, with a request for a one-session elimination of the defect that had arisen. Objectively: the coronal part of tooth 12 is completely absent, the root of tooth 12 is located at the gum level, is stable. The bite is orthognathic. X-ray studies showed the presence of filling material throughout the canal and the absence of pathological changes in the periapical tissues.

What are the possibilities for one-session manufacturing of a prosthesis design by a dentist? Name these dentures. What materials can be used for such prostheses? Assess the prognosis of treatment with these prosthesis designs.

4. Patient G., 60 years old, applied for difficulty in chewing food due to the absence of teeth. Objectively: the configuration of the face is changed due to a decrease in the interalveolar height. In the oral cavity, only the presence of the roots of teeth 13 and 23 is noted. The rest of the teeth are missing. The roots of the teeth have mobility of the I-II degree, stand 1 mm above the level of the gums. According to the patient, these teeth were previously treated for periodontitis.

your tactics. Justify the indications for the preservation or removal of the roots of the teeth.

5. When examining patient D., it was found that tooth 12 was restored with a simple pin tooth. The coronal part does not adhere tightly to the gingival margin; when probing, the hard tissues of the root of the gingival part are softened.

Determine the diagnosis. Specify the possible reasons for the development of a pathological condition on the part of the hard tissues of the root.

Is it possible to make a post-stump inlay for tooth 12 if , after removal of softened tissues, the root will be located 1 mm above the level of the gum (under the gum)?

6. When fitting the stump tab on tooth 12, the root split occurred. Specify the possible causes of the complication.

Doctor's tactics in this case?

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 15

Subject: Clinical and laboratory stages of manufacturing restorative post and core structures.
Development of treatment plan for patients with complete absence of tooth crown using post and core structures.

Purpose of the lesson: To teach students the methods of fabricating post and core restorations for the treatment of defects in the hard tissues of the tooth crown.)

OBJECTIVES OF THE LESSON:

1. Learn to plan orthopedic treatment for patients with defects in the tooth crown using post and core restorations.)
2. Learn the clinical stages of fabricating post and core restorations.)
3. Learn the laboratory stages of fabricating post and core restorations)

REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE

To fully understand the topic, the student needs to review and revise
1. Etiology of dental crown destruction)
2. Impression dental materials)
3. Requirements for the condition of the tooth root and surrounding tissues.
4. Types of posts used for restoring tooth integrity.

CONTROL QUESTIONS FROM RELATED DISCIPLINES:

1. Physical properties of metal alloys.
2. Concepts of internal stress.
3. Concepts of elasticity and resilience.
4. Physical properties of glass fiber posts.

CONTROL QUESTIONS:

:
1. Features of preparing the supra- and sub-gingival parts of the tooth for different types of post constructions. Rules for removing filling material from the root canal under the post, possible complications and their prevention.
2. Structural features and distinguishing characteristics of post-retained teeth.
3. Clinical-laboratory stages of fabricating post-retained teeth.
4. Complications in the fabrication of post-retained teeth and post-retained crown constructions.
5. Indications and contraindications for the use of elastic posts.
6. Comparative characteristics of post-retained teeth and post-retained crown constructions, their advantages and disadvantages.

The preparation of the root depends on the degree of destruction of the tooth crown. When part of the natural crown is preserved, there are two options for root preparation:

- The first involves complete grinding down of the destroyed crown.
- The second, more conservative and correct option, is aimed at preserving the strong walls of the destroyed crown. In this case, fragile, thinned, and softened walls of the tooth crown are ground down.

In cases of significant destruction or complete absence of the crown, the anatomical shape of the tooth can be restored with a post core, and then covered with a crown. Коронки на восстановленной культе имеют следующие преимущества перед другими конструкциями штифтовых зубов:

- The first type, the simplified post-retained tooth, involves using a post to support a crown without the use of a core or additional components. This is typically used when there is minimal destruction of the tooth crown.

- The second type, the post-retained tooth with an inlay, involves using a post and core to support a crown. The inlay is a custom-made restoration that fits into the prepared root canal space and provides additional support for the crown.

- The third type, the post-retained tooth with an external ring, involves using a post, core, and an external ring to support a crown. The external ring is placed around the root of the tooth and provides additional stability and support for the crown.

The fabrication of post-retained teeth involves several clinical and laboratory stages:

1. Preparing the root canal and removing any existing filling material.
2. Selecting and preparing the appropriate post and core materials.
3. Creating an impression of the prepared root canal and surrounding teeth.
4. Fabricating a temporary crown or restoration to protect the prepared tooth.
5. Fabricating the final crown or restoration in the dental laboratory.
6. Cementing or bonding the final crown or restoration onto the post-retained tooth.

Complications in the fabrication of post-retained teeth can include:

- Fracture or breakage of the post or core materials.
- Poor fit or stability of the crown or restoration.
- Inadequate retention or bonding of the crown or restoration onto the post.
- Damage to the surrounding teeth or tissues during preparation or placement.

Indications for the use of elastic posts include:

- Teeth with minimal destruction of the crown, where a simplified post-retained tooth can be used.
- Teeth with weakened or compromised root structures, where additional support is needed.
- Teeth with large root canals or irregular shapes, where a custom-made elastic post can provide better fit and stability.

Contraindications for the use of elastic posts include:

- Teeth with extensive destruction of the crown, where a post-retained crown construction may be more appropriate.
- Teeth with severely compromised root structures, where other treatment options such as extraction or implant placement may be necessary.
- Teeth with limited access or visibility for post placement and restoration.

Comparative characteristics of post-retained teeth and post-retained crown constructions include:

- Post-retained teeth provide a more conservative approach to restoring tooth integrity, as they preserve the natural tooth structure.
- Post-retained crown constructions provide better esthetics and can be used in cases with extensive destruction of the crown.
- Post-retained teeth rely on the strength and stability of the remaining tooth structure, while post-retained crown constructions rely on the support provided by the post and core materials.
- Post-retained teeth can be more prone to complications such as fracture or breakage, while post-retained crown constructions can have better long-term durability.
- Post-retained teeth can be more cost-effective, while post-retained crown constructions may require additional materials and fabrication steps.

By the method of manufacturing post-retained teeth are divided into:
- Soldered;
- Cast (monolithic, composite).

According to the performed function, they are distinguished:
- Restorative post-retained teeth, which restore the missing crown part of the tooth;
- Supportive post-retained teeth, used as a support for other dental prosthesis constructions.

Indications. Post-retained teeth are used on the front teeth of the upper jaw, first premolars, and canines of the lower jaw.

After an X-ray evaluation, the condition of the root and the surrounding bone tissue is assessed.

Based on the principle of fixation on the root, post-retained teeth are divided into:
- Teeth that rely on the crown part or a protective plate on the outer surface of the root;
- Teeth that rely on a protective plate on the outer surface of the prepared root and also enclose the protruding part of the root with a ring up to the gum line;
- Teeth that are fixed not only on the outer surface of the root but also on the inner walls of the canal.
The sequence of clinical and laboratory stages in the treatment with post-retained teeth:
- Root preparation;
- Fitting the post, if it is a wire post;
- Taking an impression, a wire post can be used by inserting it into the root canal together with wax of "lavaks" type;
- Model casting and separating it from the impression, modeling of the abutment or tooth and replacing wax with the chosen metal or combination with plastic or porcelain, grinding and polishing;
- Fitting and securing the tooth.

LDS topics: "Indications for choosing a post tooth construction considering the condition of the supragingival tissues of the tooth and the thickness of the root walls"

1. Condition of the supragingival tissues of the tooth	Complete absence of the tooth crown		
	The root of the tooth protrudes above the gum line (1 mm or more)	The root of the tooth is at the level of the gum line (less than 1 mm)	Individual surfaces are located deeper than the gum line
2. Thickness of the root walls of the tooth	Non-thinned walls	Thinned walls	Non-thinned walls
3. Types of post teeth and post constructions	Ahmedov post tooth	Simple post tooth	Ilyina-Markosyan post tooth
	Richmond post tooth	Cultivated post inlays with covering artificial crowns.	

Errors and complications in the fabrication of a post tooth.

Clinical manifestations of immediate and delayed complications resulting from incorrect decision-making regarding the indications for the use of post-retained teeth are diverse:

1. Root perforation.
Causes:
- Thin root walls;
- Root curvature;
- Softened dentin;
- Narrow or difficult-to-access canals;
- Presence of denticle;
- Pathological tooth wear.

2. Periapical inflammation.
Causes:
- Trauma to the root apex;
- Trauma and infection during root canal preparation;
- Overfilling of the root canal with filling material;
- Lack of sealing between periapical tissues and root canal;
- Exacerbation of chronic inflammatory processes.

3. Marginal periodontitis.
Causes:
- Perforation of the lateral root wall;
- Disruption of the circular ligament of the tooth.

4. Traumatic periodontitis.
Causes:
- Short root length;
- Use of a post-retained tooth as a support for a bridge prosthesis;
- Weak stability of the root prior to prosthesis placement;
- Use of a post-retained tooth as a support for clasps;
- Occlusal discrepancy.

5. Complications during the fitting of the post-retained tooth.
(The post does not fit freely and completely into the root canal)
Causes:
- Obstacle in the form of excess metal;
- Disruption of the volume and shape of the core buildup or post space preparation.

6. Complications after fixation of the post-retained tooth.
(Dissolution of cement and dislodgement of the post-retained tooth)
Causes:
- Inadequate drying of the root canal;
- Thick or liquid cement;
- Presence of air bubbles in the root canal;
- Occlusal discrepancy.

Indications for the use of elastic posts:

- Reinforcement of a tooth after endodontic treatment, with a small subgingival defect in one of the tooth walls.

- Elastic posts can only be used when the root dentin has elastic properties, ideally immediately after pulpectomy.

- Reinforcement of a composite tooth reconstruction with partial subgingival defects in the walls.

There are several indications for the use of elastic posts that do not require justification and confirm the appropriateness of their use, including:

- Allergic reactions to metal alloys and galvanic phenomena in the oral cavity.

- Reinforcement of the cusps of a tooth after endodontic treatment with subsequent composite restoration (with partial subgingival defects).

- Reinforcement of the cusps of a tooth after endodontic treatment with subsequent prosthetic restoration, especially with non-metal ceramics, which are currently the leader in aesthetic dentistry.

Advantages of elastic posts:

- Reduced stress and wedge-loading on the root walls compared to non-elastic posts.

- Creation of a monolithic structure with the hard tissues of the tooth and composite cement.

Contraindications for the use of elastic posts:

- Subgingival defects in the hard tissues of the teeth, as adhesive techniques are used for fixation of elastic posts and active mechanical retention (such as threading) is absent.

- Use of the root as a support for fixed prostheses.

Sequence of installation of a glass fiber post and restoration of the cusp of a tooth using dual-cure composite:

- Preparation of the root canal after endodontic treatment using a calibrated bur of appropriate diameter.

- Preliminary fitting of the post, ensuring that the diameter of the post does not exceed one-third of the root width, and its length is two-thirds of the root length.

- After fitting, the post is cleaned, treated with alcohol, and coated with a ceramic silane, such as "Monobond-S," for 60 seconds.

- The prepared root canal and cusp of the tooth are etched for 30 seconds and thoroughly rinsed with water, excess moisture is removed with a paper point.

- Dual-cure bonding agent, such as "LuxaBond" or "Excite DSC," is applied to the canal and air-dried.

- Dual-cure composite material, such as "LuxaCore dual," "LuxaCore Z dual," or "Variolink II," is mixed and applied to the post and canal using a spatula, followed by immediate placement of the post. Light curing is performed for 60 seconds.

- The cusp is then restored using the same dual-cure composite material directly on the fixed post, allowing for the future fixation of ceramic restorations using advanced adhesive techniques.

Currently, cusp fiber post restorations (CFPR) are considered one of the most common and effective preparations for prosthetic treatment of teeth with a destroyed crown. CFPR can be used in various clinical conditions, even when the root structure is weakened due to thinning of its walls or root destruction beneath the gum line.

Advantages of CFPR include:

- The artificial crown covering the cusp can be easily removed and replaced if necessary (e.g., for color changes or crown defects).

- A temporary crown can be made during the first visit without waiting for the permanent crown to be fabricated, which benefits patients psychologically and helps maintain their ability to work, especially for individuals in lecturing or artistic professions.

- When a neighboring tooth is extracted, the external crown can be removed and the cusp can be reused as a support for a bridge prosthesis.

- CFPR allows for the placement of a bridge prosthesis even with non-parallel root canals used as supports.

- Roots with partially or fully covered gum surfaces can be used without prior gingivectomy.

- The post can be custom-made to precisely match the shape of the prepared root canal, creating a monolithic connection between the post and root, ensuring reliable prosthesis fixation.

- There are a wide range of options for selecting the type of artificial crown (covering structure).

SITUATIONAL TASKS

1. Upon examination of patient D, it was found that tooth 21 had been restored with a simple post. The coronal part does not fit tightly against the gum line, and the hard tissues of the root in the subgingival area are softened upon probing. The diagnosis is a compromised tooth with weakened root structure. Possible causes for this pathological condition from the hard tissues of the root include inadequate root canal treatment, trauma, or infection. It is possible to fabricate a cusp fiber post restoration (CFPR) on tooth 21 if the softened tissues are removed and the root is positioned 1mm above the gum level.

2. During the fitting of a cusp fiber post restoration on tooth 32, the root fractured. Possible causes for this complication include excessive force during preparation or fitting, weakened root structure, or anatomical variations in the root. The dentist's approach would be to evaluate the extent of the fracture and determine if the remaining root structure is stable enough to support a different type of restoration, such as an implant or bridge.

3. Patient O, during the fabrication of a cusp fiber post restoration on tooth 22, after removing 2/3 of the root canal filling, a wax modeling of the post was performed using "Lavaks." After removing the wax composition from the root canal, it was found that the length of the post was only 1/3 of the canal length. Possible causes for this error include incorrect measurement or estimation of the canal length, inaccurate wax modeling, or improper removal of excess wax. Options for rectifying this error could include remeasuring and remaking the post to the correct length or considering alternative restoration options.

4. Patient S, 25 years old, presented with complaints of an aesthetic defect caused by a fractured coronal part of tooth 12. Objectively, the coronal part of tooth 12 is completely missing, and the root is at the gum level but stable. The occlusion is orthognathic. Radiographic examinations showed the presence of a filling material throughout the canal and no pathological changes in the periapical tissues. The diagnosis is a fractured crown of tooth 12. The treatment plan would involve removing any remaining root fragments, performing root canal treatment if necessary, and fabricating a prosthetic crown or bridge to restore the missing coronal part of tooth 12. One possible option for single-session fabrication of the prosthesis by the dentist could be using chairside CAD/CAM technology to create a ceramic restoration.

5. Patient G, 60 years old, presented with difficulty chewing due to missing teeth. Objectively, there is a decrease in interalveolar height, and only roots of teeth 13 and 23 remain. The other teeth are missing. The roots have mobility of grade I-II and protrude 1mm above the gum level. According to the patient, these teeth were previously treated for periodontitis. The dentist's approach would involve evaluating the overall oral health, including the condition of the remaining roots, bone support, and periodontal status. If the roots are deemed healthy and have sufficient bone support, they may be preserved and used as abutments for a removable or fixed prosthesis. However, if the roots are compromised or there are significant periodontal issues, extraction and implant-supported restorations may be considered.

6. Patient M, 25 years old, complained of pain in tooth 16 when biting down. Three months ago, a metal post was fabricated for the restoration of tooth 16. Upon examination, it was found that the defect in the coronal part of tooth 16 (Black's classification type II) had been restored with a metal post. There is a cement line between the base of the cavity and the post, and percussion of tooth 16 is painful. The situation indicates a possible failure of the restoration, with cement leakage and potential infection or irritation of the periapical tissues. The dentist's approach would be to evaluate the integrity

of the restoration, assess the presence of infection or inflammation, and determine the appropriate treatment, which may include removing the post and restoring the tooth with a different type of restoration.

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.

CLASS 16

Subject: Orthopedic treatment of patients with dental crown defects.
Treatment plan development. *Selection of materials for fixation of glass fiber posts, obtaining impressions using alginate and silicone materials.*

Purpose of the lesson: To control and reinforce the knowledge acquired by students regarding examination, diagnosis, selection of construction, and clinical-laboratory stages of manufacturing orthopedic constructions used in the orthopedic treatment of patients with dental crown defects.

OBJECTIVES OF THE LESSON

1. Systematize knowledge about methods of diagnosing dental crown defects and orthopedic treatment options for this pathology.
2. Reinforce knowledge about construction manufacturing technologies used to restore dental crown defects.
3. Reinforce practical skills in preparing tooth roots and crowns for various orthopedic constructions.
4. Reinforce practical skills in obtaining alginate and silicone impressions and casting gypsum models.

CONTROL QUESTIONS:

1. Types of non-removable dental prostheses used to restore the anatomical form of dental crowns. Indications for choosing non-removable prosthesis constructions and construction materials.
2. Basic principles of tooth preparation for non-removable orthopedic constructions.
3. Methods of obtaining impressions and manufacturing models in non-removable prosthetics, indications for choosing impression methods and model manufacturing.
4. Basic technologies for working with construction materials in non-removable prosthetics.
5. Clinical-laboratory stages of manufacturing artificial crowns based on stamping technology, including main and auxiliary materials.
6. Clinical-laboratory stages of manufacturing solid, MA, and MC artificial crowns.
7. Comparative characteristics of non-metallic constructions and their manufacturing technologies.
8. Indications and contraindications for the use of different types of restorative post constructions, as well as clinical-laboratory stages of their manufacturing.
9. Prosthesis fixation (temporary and permanent).
10. Possible errors made in the manufacturing of different microprosthesis and artificial crown constructions, and methods for their correction.

SITUATIONAL TASKS

1. In tooth 26, there is a Class I cavity on 2/3 of the occlusal surface according to Black's classification. To calculate the IRDPZ (interocclusal reduction preparation zone), measure the remaining tooth structure and determine the appropriate reduction for the cuspal overlay. The type of restoration needed would be a cuspal overlay.

2. After removing softened dentin in a Class I cavity on tooth 37, patient V. has thin walls and an IRDPZ of 0.8. The diagnosis is a Class I cavity with thin walls on tooth 37. The treatment plan may involve using a restorative material such as composite resin to restore the cavity and reinforce the weakened walls.

3. During the formation of a flat floor in a Class V cavity on tooth 21 under infiltration anesthesia, the pulp chamber was accidentally exposed. The cause of the dental error is improper depth control during cavity preparation. To prevent this complication, proper training and technique in cavity preparation should be followed, including maintaining a proper depth and using appropriate instruments.

4. Patient V., 22 years old, experiences persistent dull pain after vital tooth preparation for a veneer on tooth 22. Possible causes of the pain could include pulp irritation or inflammation, improper bonding technique, or occlusal interference. The tactic would be to evaluate the pulp vitality, check for any signs of inflammation or infection, assess the bonding technique and occlusion, and provide appropriate treatment such as endodontic therapy or occlusal adjustment.

5. After preparing teeth 11, 12, 21, and 22, impressions were taken using alginate material, and the next day, a digital scan of the models was performed. Veneers were milled using CEREC technology. During try-in, it was observed that the veneers did not reach the desired margin by 0.5mm. Possible errors could include inaccurate impression taking, improper milling, or inadequate communication with the dental laboratory. The tactic would be to reassess the margins and communicate with the dental laboratory to address any discrepancies and ensure proper fit.

6. Patient K. presents with a fractured crown on tooth 2.7. The objective findings include an orthognathic bite, intact teeth except for tooth 2.7 with caries and destruction of the buccal, lingual, and distal surfaces. Tooth 2.7 has also changed in color. The cavity is not filled, and there is pain on percussion. The tooth is stable, and the crown-to-root ratio is 1:2. The treatment plan would involve removing the carious tissue, restoring the tooth with a suitable restoration (such as a composite filling or a crown), and addressing any underlying causes of the fracture. Contraindications for artificial crown coverage at this time could include active infection or inadequate remaining tooth structure. The preferred type of artificial crown would depend on factors such as esthetics, function, and patient preference.

7. A week ago, the patient received cast metal crowns on teeth 36, 37, 46, and 47. The patient complains of lack of contact on the anterior teeth and sharp pain when biting on teeth 36, 37, 46, and 47. The complication may be due to improper occlusion or inadequate adjustment of the crowns. The tactic would be to evaluate the occlusion and perform any necessary adjustments to ensure proper contact and occlusal harmony.

8. During the try-in of full-cast crowns on teeth 17 and 27, it was observed that there were no tight contacts with teeth 16, 26, and the opposing teeth. Possible causes could include improper tooth preparation, inaccurate impressions, or errors in the fabrication of the crowns. The dentist should reassess the fit of the crowns and make any necessary adjustments or remakes to achieve proper contacts.

9. During the evaluation of the construction of metal-acrylic crowns on teeth 11 and 21, metal elements are visible through the layer of acrylic resin. Possible causes could include inadequate coverage of the metal framework with acrylic resin or improper fabrication technique. The dentist should address this issue by adding additional layers of acrylic resin or considering remaking the crowns if necessary.

10. While evaluating the construction of a metal-ceramic crown on tooth 35, a chip occurred, exposing the metal framework. Possible causes could include insufficient thickness or strength of the ceramic veneer, improper bonding technique, or occlusal trauma. The dentist should assess the extent of the damage and determine whether a repair can be made or if a remake is necessary.

11. Patient K., 38 years old, complains of a mismatch in color of the pressed ceramic crown that was made 3 weeks ago to replace a previously existing metal-ceramic restoration. Objective findings: the artificial crown on tooth 12 matches in shape but has a noticeable color difference from the adjacent teeth, appearing more gray. On dental radiograph, the crown's fit at the cervical area is good, the root canal is fully sealed, there are no periapical changes, and the metal post of the core build-up is located in 2/3 of the root canal. Possible causes of the complication could include improper selection or shading of the ceramic material or a mismatch between the shade of the crown and the adjacent teeth. The dentist can address this issue by discussing shade options with the patient and considering remaking the crown if necessary.

12. Patient K., 28 years old, presents with a complaint of aesthetic issues with tooth 12, which was restored with a pressed ceramic crown about a week ago. Objective findings: the artificial crown protrudes vestibularly more than 0.5mm compared to the neighboring teeth. Possible causes of this situation could include improper tooth preparation, inadequate reduction of the tooth structure, or

inaccuracies in the fabrication of the crown. The dentist's actions would involve assessing the fit and alignment of the crown, determining if any adjustments can be made to improve its position, and discussing potential options with the patient, such as remaking the crown or considering alternative treatment options.

13. During examination of patient D., it is determined that tooth 21 is restored with a simple post and core. The coronal portion does not fit tightly against the gingival margin, and upon probing, the hard tissues of the root in the subgingival area are softened. The diagnosis is a poorly fitting restoration on tooth 21 with possible root pathology. Possible causes of this pathological condition from the hard tissues of the root could include inadequate sealing of the root canal, presence of bacterial infection or inflammation, or failure to properly restore the tooth with a post and core. It may be possible to fabricate a cuspal overlay on tooth 21 if the softened tissues are removed and the remaining root is at least 1mm above the gum level.

14. While fitting a post and core on tooth 12, the root fractures. Possible causes of this complication could include excessive force during preparation, weakened tooth structure, or presence of underlying pathology such as caries or cracks. The dentist's tactic would be to assess the extent of the fracture, evaluate the remaining tooth structure, and determine the appropriate treatment plan, which may involve extraction of the tooth and considering options for tooth replacement such as an implant-supported restoration.

15. Patient S., 25 years old, presents with complaints of an aesthetic defect caused by a fracture of the coronal portion of tooth 12. Objective findings: the coronal portion of tooth 12 is completely missing, and the root is at the gum level. The tooth is stable, and the bite is orthognathic. Radiographic examination shows a fully sealed root canal without any periapical changes. The diagnosis is a fractured crown on tooth 12. The treatment plan would involve discussing options for restoring the tooth, such as a dental implant or a fixed dental bridge. One possible option for single-session prosthetic construction by the dentist could be utilizing chairside CAD/CAM technology to fabricate a ceramic crown or bridge.

LITERATURE

Basic:

1. Fundamentals of fixed prosthodontics / Shillingburg, Hebert T., Sather, David A., Wilson, Edwin L. [и др.]. – 4th ed. – Chicago [etc.] : Quintessence Publishing Co, 2012. – 574 p. : ill. by S.E. Stone. – Index: p. 555-574. – Основы ортопедической стоматологии.
2. Prosthetic Dentistry / V.P. Nespriadko [et al.]. – Житомир : Полісся, 2015. – 260 с.

Additional:

3. Fixed dentures. Algorithm of producing. («Клинико-лабораторные этапы изготовления несъемных зубных протезов») / С. А. Наумович [и др.]. – 3-е изд. – Мн. : БГМУ, 2018. – 30 с.
4. Lomiashvili L.M., Ayupova L.G. Artistic modelling and restoration of teeth. –Omsk: Polygraph. 2008, 288 p. – ill.