

BDS II year

GENERAL PATHOLOGY

1. COURSE CONTENT

A General Pathology

1. Introduction to pathology

The cell in health

The normal cell structure

The cellular functions

2. Etiology and pathogenesis of Disease

Cell Injury

Types – congenital

Acquired

Mainly Acquired causes of disease

(Hypoxic injury, chemical injury, physical injury, immunological injury)

3. Degenerations

Amyloidosis

Fatty change

Cloudy swelling

Hyaline change, mucoid degeneration

4. Cell death & Necrosis

Apoptosis

Def, causes , features and types of necrosis

Gangrene – Dry, wet, gas

Pathological Calcifications

(Dystrophic and metastatic)

5. Inflammation

- Definition, causes types, and features

- Acute inflammation

a. The vascular response

b. The cellular response

c. Chemical mediators

d. The inflammatory cells

e. Fate

- Chronic inflammation

Granulomatous inflammation

6. Healing

- Regeneration

- Repair

a. Mechanisms

b. Healing by primary intention

c. Healing by secondary intention

d. Fracture healing

e. Factors influencing healing process

f. Complications

7. Tuberculosis

- Epidemiology

- Pathogenesis (Formation of tubercle)

- Pathological features of primary and secondary TB

- Complication and Fate

8. Syphilis

- Epidemiology

- Types and stages of syphilis
 - Pathological features
 - Diagnostic criteria
 - Oral Lesions
9. Typhoid
- Epidemiology
 - Pathological features
 - Diagnostic criteria
10. Thrombosis
- Definition, Pathophysiology
 - Formation, complications & Fate of a thrombus
11. Embolism
- Definition
 - Types
 - Effects
12. Ischaemia and Infarction
- Definition, etiology type
 - Infarction of various organs
13. Derangements of body fluids
- Oedema – pathogenesis
 - Different types
14. Disorders of circulation
- Hyperaemia
 - Shock
15. Nutritional Disorders
- common vitamin Deficiencies
16. Immunological mechanisms in disease
- Humoral & cellular immunity
 - Hypersensitivity & autoimmunity
17. AIDS and Hepatitis
18. Hypertension
- Definition, Classification
 - Pathophysiology
 - Effects in various organs
19. Diabetes Mellitus
- Def, Classification, Pathogenesis, Pathology in different organs
20. Adaptive disorders of growth
- Atrophy & Hypertrophy, Hyperplasia, Metaplasia and Dysplasia
21. General Aspects of neoplasia
- a. Definition, terminology, Classification
 - b. Differences between benign and malignant neoplasms
 - c. The neoplastic cell
 - d. Metastasis
 - e. Etiology and pathogenesis of neoplasia. Carcinogenesis
 - f. Tumour biology
 - g. Oncogenes and anti- oncogenes
 - h. Diagnosis
 - i. Precancerous lesions
 - j. Common specific tumours sq papilloma & Basal cell ca, Adenoma & Adenocarcinoma, Fibroma & Fibrosarcoma, Lipoma and Liposarcoma

B. Systemic Pathology –

22. Anaemias

- Iron Deficiency anaemia, Megaloblastic anaemia

23. Leukaemias
 - Acute and chronic leukaemias, Diagnosis and clinical features
24. Diseases of Lymph nodes
 - Hodgkin's disease, Non Hodgkins lymphoma, Metastatic Carcinoma
25. Diseases of oral cavity
 - Lichen planus, Stomatitis, Leukoplakia, Sq cell Ca, Dental caries, Dentigerous cyst, Ameloblastoma
26. Diseases of salivary gland
 - Normal Structure Sialadenitis, Tumours
27. Common diseases of Bones
 - Osteomyelitis, Metabolic, bone diseases, Bone Tumours, Osteosarcoma, Osteocalstoma, Giant cell Tumour, Ewing's sarcoma, Fibrous dysplasia, Aneurysmal bone cyst.
28. Disease of Cardiovascular system
 - Cardiac failure
 - Congenital heart disease – ASD, VSD, PDA
 - Fallot's Tetralogy
 - Infective Endocarditis
 - Atherosclerosis
 - Ischaemic heart Disease
29. Haemorrhagic Disorders
 - Coagulation cascade
 - Platelet function
 - Platelet disorders

MICROBIOLOGY

A. GENERAL MICROBIOLOGY

1. History, Introduction, scope, Aims and Objectives.
2. Morphology and physiology of bacteria.
3. Detail account of sterilisation and Disinfection.
4. Brief account of culture media and culture techniques.
5. Basic knowledge of selection, collection, transport, processing of clinical specimens and identification of bacteria.
6. Bacterial Genetics and Drug Resistance in bacteria.

B. IMMUNOLOGY:

1. Infection – Definition, classification, source, mode of transmission and types of infectious disease.
2. Immunity
3. structure and functions of Immune system
4. The Complement system
5. Antigen
6. Immunoglobulin - Antibodies – General structure and the role played in defense mechanism of the body
7. Immune – response
8. Antigen – Antibody reaction – with reference to clinical utility.
9. Immuno deficiency disorders – a brief knowledge of various types of immuno deficiency disorder – A sound knowledge of immuno deficiency disorder relevant to dentistry.
10. Hypersensitivity reactions

11. Autoimmune disorder – Basic knowledge of various types – sound knowledge of autoimmune disorder of oral cavity and related structures.
12. Immunology of transplantation and malignancy
13. Immunohematology

C. SYSTEMATIC BACTERIOLOGY

1. Pyogenic cocci - Staphylococcus, Streptococcus, Pneumococcus, Gonococcus, Meningococcus – brief account of each cococcus- detailed account of mode of spread, Laboratory diagnosis, Chemo therapy and prevention – Detailed account of Cariogenic Streptococci.
2. Corynebacterium diphtheriae – mode of spread, important clinical feature, Laboratory diagnosis, Chemotherapy and Active immunization.
3. Mycobacteria – Tuberculosis and Leprosy
4. Clostridium – Gas gangrene, food poisoning and tetanus.
5. Non – sporing Anaerobes – in brief about classification and morphology in detail about dental pathogens – mechanism of disease production and prevention.
6. Spirochaetes – Treponema pallidum – detailed account of oral Lesion of syphilis, Borrelia vincentii.
7. Actinomycetes.

D. VIROLOGY

1. Introduction
2. General properties, cultivation, host- virus interaction with special reference to Interferon.
3. Brief account of Laboratory diagnosis , Chemotherapy and immuno prophylaxis in general.
4. A few viruses of relevance to dentistry.
 - Herpes Virus.
 - Hepatitis B virus – brief about other types
 - Human immunodeficiency Virus (HIV)
 - Mumps virus
 - Brief – Measles and Rubella virus
5. Bacteriophage – structure and significance

E MYCOLOGY

1. Brief Introduction
2. Candidosis – in detail
3. Briefly on oral lesions of systemic mycoses.

F. PARASITOLOGY

1. Brief introduction – protozoans and helminthes
2. Brief knowledge about the mode of transmission and prevention of commonly seen parasitic infection in the region.

GENERAL AND DENTAL PHARMACOLOGY AND THERAPEUTICS –II BDS

LECTURE:

1. GENERAL PHARMACOLOGY

1. General principles of pharmacology, sources and nature of drugs dosage forms; Prescription writing: pharmacokinetics (absorption, distribution, metabolism and excretion of drugs), mode of action of drugs, combined effects of drugs, receptor mechanism of drug action, factors modifying drug response, adverse drug reactions; drug interaction, Implications of General Principles in clinical dentistry.
2. CNS drugs; General anaesthetics, hypnotics, Implications of these drugs in clinical dentistry,
3. Autonomic drugs; sympathomimetics, antiadrenergic drugs parasymphomimetics and parasympatholytics, Implications of Autonomic drugs in clinical dentistry
4. Cardiovascular drugs; Cardiac stimulants; antihypertensive drugs, vasopressor agents, treatment of shock, Antianginal agents and diuretics, Implication of these drugs in clinical dentistry.
5. Autocoids :
Histamine, antihistamines, prostaglandins, leukotrienes and bronchodilators, Implication of Autocoids in clinical dentistry.
6. Drugs acting on blood ; coagulants and anticoagulants, hematinics, Implications of these drugs in clinical dentistry.
7. G.I.T. Drugs, Purgatives, anti- diarrhoeal Implications of these drugs in clinical dentistry.
8. Endocrines; Emphasis on treatment of diabetes and glucocorticoids, thyroid and antithyroid agents, drugs affecting calcium balance and anabolic steroids, Implications of these drugs. In clinical dentistry.
9. Chemotherapy: Antimicrobial agents (against bacteria, anaerobic infections, fungi, virus and broad spectrum). Infection management in dentistry. Pharmacotherapy of Tuberculosis, leprosy and chemotherapy of malignancy in general. Implications of Chemotherapy in clinical dentistry.
10. Vitamins: Water soluble vitamins, Vit. D, Vit.K. and Vit. E, Implications of Vitamins in clinical dentistry.
11. Pharmacotherapy of emergencies in dental office and emergency drugs tray Implications of Pharmacotherapy in clinical dentistry.
12. Chelating agents - BAL, EDTA and desferrioxamine,

II. DENTAL PHARMACOLOGY

1. Anti - septic; astringents, obtundents, mummifying agents, bleaching agents, styptics, disclosing agents, dentifrices, mouth washes, caries and fluorides.
2. Pharmacotherapy of common oral conditions in dentistry.

Practicals and Demonstrations:

To familiarise the student with the methodology: prescription writing and dispensing. Rationale of drug combinations of marketed drugs.

DENTAL MATERIAL – II YEAR BDS

1. STRUCTURE OF MATTER AND PRINCIPLES OF ADHESION.

Change of state, inter atomic primary bonds, inter atomic, secondary bonds, inter atomic bond distance and bonding energy, thermal energy, crystalline structure, non crystalline structures, diffusion, adhesion and bonding and adhesion to tooth structures.

2. IMPORTANT PHYSICAL PROPERTIES APPLICABLE TO DENTAL MATERIALS

Physical properties "are ,based on laws of mechanics, acoustics, optics, thermodynamics, electricity, magnetism, radiation, atomic structure or nuclear phenomena, Hue, value" chroma and translucency physical properties based on laws of' optics, dealing with phenomena of light, vision and sight. Thermal conductivity & coefficient of thermal expansion are physical properties based on laws of thermodynamics. Stress, strain, proportional limit, elastic limit yield strength, modulus of elasticity, flexibility, resilience, impact~ impact strength, permanent deformation, strength, flexure strength fatigue, static fatigue, toughness, brittleness, ductility & malleability, hardness, abrasion resistance, relaxation, rheology, Thixotropic, creep, static creep, dynamic creep, flow, 'colour, three dimensional colour - hue, values, chroma, Munsell system, metamersim, fluorescence, physical properties of tooth, stress during mastication

3. BIOLOGICAL CONSIDERATIONS IN USE OF DENTAL MATERIALS.

Materials used are with ,the knowledge of appreciation of certain biological considerations for use in oral cavity. Requirement of materials with biological compatibility, Classification of materials from perspective of biological compatibility. ego contact with soft tissues, affecting vitality of pulp, used for root' canal fillings, affecting hard tissues of teeth, laboratory materials that could be accidentally be inhaled or ingested during handling. Hazards associated with materials: pH-affecting pulp, polymers causing chemical irritation, mercury toxicity, etc. Microleakage, Thermal changes, Galvanism, toxic effect of materials. Biological evaluation for systemic toxicity, skin irritation, mutagenicity and carcinogenicity. Disinfection of dental materials for 'infection

control

4. GYPSUM & GYPSUM PRODUCTS.

Gypsum - its origin, chemical formula, Products manufactured from gypsum.

Dental plaster, Dental stone, Die stone, high strength, high expansion stone.

Application and manufacturing procedure of each, macroscopic and microscopic structure of each. Supplied as and Commercial names.

Chemistry of setting, setting reaction, theories of setting, gauging water, Microscopic structure of set material.

Setting time: working time and setting time, Measurement of setting time and factors controlling setting time.

Setting expansion, Hygroscopic setting expansion - factors affecting each Strength wet strength, dry strength, factors affecting strength, tensile strength

Slurry - need and use.

Care of cast. ' ,

ADA classification of gypsum products

Description of impression plaster and dental investment

Manipulation including recent methods or advanced methods, Disinfection: infection control, liquids, sprays, radiation

Method of use of disinfectants.

Storage of material - shelf life

5. IMPRESSION MATERIALS USED IN DENTISTRY

Impression plaster, impression compound, Zinc oxide eugenol impression paste & bite registration paste incl., non eugenol paste, Hydrocolloids, reversible and irreversible, Elastomeric impression materials. Polysulphide, Condensation silicones, Addition silicones, Polyether, Visible light cure polyether urethane dimethacrylate, "Historical background & development of each impression material.

Definition of impression, Purpose of making impression, Ideal properties required and application of material, Classification as per ADA specification, general & individual impression material.

Application and their uses in different disciplines, Marketed as and their commercial names, Mode of supply & mode of application bulk/wash

impression. Composition, chemistry of setting, Control of setting time, Type of impression trays required, Adhesion to tray, manipulation, instruments & equipments required. Techniques of impression, storage of impression, (Compatibility with cast and die material). Any recent advancements in material and mixing devices, Study of properties: Working time, setting time, flow, accuracy, strength, flexibility, tear strength, dimensional stability, compatibility with cast & die materials incl. electroplating Biological properties: tissue reaction, Shelf life & storage of material, Infection control - disinfection, Advantages & disadvantages of each material.

6. SYNTHETIC RESINS USED IN DENTISTRY.

Historical background and development of material, Denture base materials and their classification and requirement.

Classification of resins

Dental resins - requirements of dental resins, applications, polymerisation, polymerisation mechanism stages in addition polymerisation, inhibition of polymerisation, co polymerization, molecular weight, crosslinking, plasticizers, Physical properties of polymers, polymer structures types of resins.

ACRYLIC RESINS:

Mode of polymerisation: Heat activated, Chemically activated, Light activated, Mode of supply, application, composition, polymerisation reaction of each. Technical considerations: Methods of manipulation for each type of resin. Physical properties of denture base resin. Miscellaneous resins & techniques: Repair resins, Relining and rebasing. Short term and long-term soft-liners, temporary crown and bridge resins, Resin impression trays, Tray materials, Resin teeth, materials in maxillofacial prosthesis, Denture cleansers, Infection control in detail, Biological properties and allergic reactions.

RESTORATIVE RESINS:

Historical background, Resin based restorative materials, Unfilled & filled, Composite restorative materials, Mode of supply, Composition, Polymerisation mechanisms: Chemically activated, Light activated, Dual cure: Degree of conversion, Polymerisation shrinkage Classification of Composites:

Application, composition and properties of each Composites of posterior teeth, Prosthodontics resins for veneering. Biocompatibility - microleakage, pulpal reaction, pulpal protection Manipulation of composites: Techniques of insertion of Chemically activated, light activated, dual cure Polymerisation, Finishing and polishing of restoration, Repair of composites Direct bonding Bonding: Need for bonding, Acid - etch technique, Enamel bonding, Dentin bonding agents. Mode of bonding, Bond strength, Sandwich technique its indication and procedure. Extended application for composites: Resins for restoring eroded teeth, Pit and fissure sealing, Resin inlays system - Indirect & direct, Core build up, Orthodontic applications.

7. METAL AND ALLOYS:

Structure and behaviour of metals, Solidification of metals, mechanism of crystallisation amorphous & crystalline: Classification of alloys, Solid solutions, Constitutes or equilibrium phase diagrams : Electric alloys, Physical properties, Peritectic alloys, Solid state reaction other binary systems: Metallography & Heat treatment. Tarnish and corrosion. Definition: causes of corrosion, protection against corrosion., Corrosion of dental restorations, clinical significance of galvanic current, Dental Amalgam.

History:

Definition of dental amalgam, application, Alloy classification, manufacture of alloy powder composition - available as .

Amalgamation: setting reaction & resulting structure, properties, Microleakage Dimensional stability, Strength, Creep, Clinical performance

Manipulation: Selection of alloy, proportioning, mechanism of trituration, condensation, carving & finishing. Effect of dimensional changes, Marginal deterioration, Repair of amalgam, mercury toxicity, mercury hygiene

DIRECT FILLING GOLD:

Properties of pure gold, mode of adhesion of gold for restoration forms of direct filling gold for using as restorative material

Classification: Gold Foil, Electrolytic precipitate, powdered gold.

Manipulation: Removal of surface impurities and compaction of direct filling gold. Physical properties of compacted gold, Clinical performance.

DENTAL CASTING ALLOYS:

Historical background, desirable 'properties of casting alloys.

Alternatives to cast metal technology: direct filling gold, amalgam, mercury

free condensable intermetallic compound -' an alternative to metal casting process. CAD-CAM process for metal & ceramic inlays - without need of impression of teeth or casting procedure, pure titanium, most ,bio compatible metal ,which are difficult to cast can be made into crowns with the aid of 'CAD- CAM technology Another method of making copings - by copy milling (without casting procedures).

Classification of casting alloys: By function & description.

Recent classification, High ndhie (HN), Noble (N) and predominantly base metal (PB)

Alloys for crown & bridge, metal ceramic & removable partial denture. Composition, function, constituents and application, each alloy both noble and base metal. Properties of alloys: Melting range; mechanical properties, hardness elongation, modulus of elasticity, tarnish and corrosion.

Casting shrinkage and compensa.ion of casung shrinkage. Biocompatability - Handling hazards & precautions of base metal alloys, casting investments used. Heat treatment: Softening & hardening heat treatment. Recycling of metals, Titanium alloys & their application , properties & advantages. Technical consideration In casting. Heat source, furnaces.

8. DENTAL WAXES INCLUDING INLAY CASTING WAX

Introduction and importance of waxes: sources· of natural waxes and their chemical nature. Classification of Waxes:

Properties: melting range, thermal expansion, mechanical properties, flow & residual stresses, ductility. Dental Wax: Inlay wax; Mode of supply: Classification & composition, Ideal requirements: Properties of inlay wax: Flow, thermal properties Wax distortion &. its causes.

Manipulation of inlay wax: instruments & equipment required, including electrically heated instruments metal tips and thermostatically controlled wax baths.

Other waxes: Applications, mode of supply & properties.

Casting Wax, Base plate wax, Processing wax, Boxing wax, Utility wax, Sticky wax, Impression wax for corrective impressions, Bite registration wax.

9. DENTAL CASTING INVESTMENTS.

Definition, requirements, classification

Gypsum bonded - classification. Phosphate bonded; Silica bonded

Mode of Supply: Composition, application, setting mechanism, setting time & factors controlling.

Expansions : Setting expansion, Hygroscopic Setting expansion, & thermal expansion : factors affecting. Properties: Strength, porosity, and fineness & storage. Technical considerations: For Casting procedure, Preparation of die, wax pattern, spruing, investing, control of shrinkage compensation, wax burnout, and heating the invested ring, casting. Casting machines, source of heat for melting the alloy. Defects. in casting.

10. SOLDERING: BRAZING AND WELDING

Need of joining dental appliances, Terms & Definition

Solders: Definition, ideal requirement, types of solders - Soft & hard' and their fusion temperature, application. Mode of supply of solders, Composition and selection, Properties. Tarnish & corrosion resistance mechanical properties, microstructure of soldered joint. Fluxes & Anti fluxes: Definition, Function, Types, commonly used fluxes & their selection Technique of Soldering & Brazing: free hand soldering and investment, steps and procedure. Welding,: Definition, application, requirements, procedure, weld decay - causes and how to avoid it. Laser welding.

WROUGHT BASE' METAL ALLOYS

Applications and different alloys used mainly for orthodontics purpose

1. Stainless steel
2. Cobalt chromium nickel
3. Nickel titanium
4. Beta titanium

Properties required for orthodontic wires, working range, springiness, stiffness, resilience, Formability, ductility, ease of joining, . corrosion resistance, stability in oral environment, bio compatibility

Stainless steels: Description, type, composition & properties of each type. Sensitisation & stabilisation , Mechanical properties - strength, tensile, yield

strength, KHN. Braided & twisted wires their need, Solders for stainless steel, Fluxes, Welding

1. Wrought cobalt chromium nickel alloys, composition, allocation, properties, heat treatment, physical properties
2. Nickel - Titanium alloys, 'shape, memory & super elastic
3. Titanium alloys, application, composition, properties, welding, Corrosion resistance

11. DENTAL CEMENTS

Definition & Ideal requirements:

Cements: Silicate. Glass ionomer, metal modified class ionomer, resin modified glass ionomer, zinc oxide eugenol, modified zinc oxide eugenol, zinc phosphate, zinc silico phosphate, zinc poly carboxylate, Cavity liners and cement bases, Varnishes Calcium hydroxide, Gutta percha

Application, classification (general and individual), setting mechanism, mode of supply, Properties, factors affecting setting, special emphasis on critical procedures of manipulation and protection of cement, mode of adhesion, biomechanism of caries inhibition.

Agents for pulpal protection, Modifications and recent advances, Principles of cementation. Special emphasis on cavity liners and cement bases and luting agents.

12. DENTAL CERAMICS

Historical background & General applications.

Dental ceramics : definition, classification, application, mode of supply, manufacturing procedure, methods of strengthening. Properties of fused ceramic: Strength and factors affecting, modulus of elasticity, surface hardness, wear resistance, thermal properties, specific gravity, chemical stability, esthetic properties, biocompatibility, technical considerations.

Metal Ceramics (PFM): Alloys - Types and composition of alloys. Ceramic - Type and Composition.

Metal Ceramic Bond - Nature of bond. Bonding using electro deposition, foil copings, bonded platinum foil, swaged gold alloy foil coping. • Technical considerations for porcelain and porcelain fused metal restorations. Recent advances - all porcelain restorations, Manganese core, injection moulded, castable ceramics, glass infiltrated alumina core ceramic'(In ceram), ceramic

veners, inlays and onlays, and CAD - CAM ceramic. Chemical attack of ceramic by fluoride. Porcelain furnaces.

13. ABRASION & POLISHING AGENTS

Definition of abrasion and polishing. Need of abrasion and polishing. Types of abrasives: Finishing, polishing & cleaning. Types of abrasives: Diamond, Emery, aluminium oxides garnet, pumice, Kieselgurh, tripoli, rouge, tin oxide, chalk, chromic oxide, sand, carbides, diamond, zirconium silicate Zinc oxide

ABRASIVE ACTION:

Desirable characteristics of an abrasive, Rate of abrasion, Size of particle, pressure and speed.

Grading of abrasive & polishing agents. Binder, Polishing materials & procedures used. Technical consideration - Material and procedure used for abrasion and polishin Electrolytic polishing and burnishing.

14. DIE AND COUNTER DIE MATERIALS INCLUDING ELECTROFORMING AND ELECTROPOLISHING.

Types - Gypsum products, Electroforming, Epoxy resin, Amalgam.

15. DENTAL IMPLANTS: Evolution of dental implants, types and materials.

16. MECHANICS OF CUTTING: Burs and points.

At the end of. the course the student should have the knowledge about the composition, properties, manipulative techniques and their various commercial names. The student should also acquire skills to select and use the materials appropriately for laboratory and clinical use.

PRE CLINICAL CONSERVATIVE. DENTISTRY LABORATORY
EXERCISES

1. Identification and study of handcutting instruments chisels, gingival margin trimmers, excavators and hatchet.

2. Identification and use of rotary cutting instruments in contra angle hand pieces burs (Micromotor)

3. Preparation class I and extended class I and class II and MOD's and class V amounting to 10 exercises ill plaster models.

4.10 exercises in mounted extracted teeth of following class I, 4 in number class I extended cavities 2, class II 4 in number and class V 2 in number. Cavity preparation base application matrix and wedge placement restoration with amalgam.

5.Exercises on phantom head models which includes cavity preparation base and varnish application matrix and wedge placement followed by amalgam restoration.

Class I	5
Class I with extension	2
Class II	10
Class II Mods	2
Class V and III for glass ionomers	4
Class V for amalgam	2

6. Polishing of above restorations.

7. Demonstration of Class III and Class V cavity preparation. For composites on extracted tooth completing the restoration.

8. Polishing and finishing of the restoration of composites.

9. Identification and manipulation of varnish bases like Zinc; Phosphate, Poly carboxylate, Glass Ionomers, Zinc Oxide, Eugenol cements.

10. Identification and manipulation of various matrices, tooth separators and materials like composites and modified glass ionomer cements.

11. Cast Restoration

1. Preparation of Class II inlay cavity
2. Fabrication of wax pattern
3. Sprue for inner attachment investing
4. Investing of wax pattern
5. Finishing and cementing of class II inlay in extracted tooth.

12. Endodontics

1. Identification of basic endodontic instruments
2. Coronal access cavity preparation on extracted, Upper central incisors
3. Determination of working length.
4. Biomechanical preparation of root canal space of central incisor
5. Obfuration of root canal spaces. Absens of coronal access cavity.
6. Closure of access cavity.