

## **ENDODONTICS**

# VERTICAL ROOT FRACTURE PRE-EXISTING CRACKS IN ROOTS



BY DR. JIGYASA SHARMA

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#### **Affected Teeth**

- VRF more frequently occurs in root canal filled teeth.
- Anterior teeth are less affected than posterior teeth due to higher occlusal loading.

#### Fracture Locations

- Anterior fractures commonly star from the cervical region.
- Cervical and apical origin fractures in other teeth occur at similar frequencies.

#### Post System Considerations ←

- Cast post preparation can remove critical dentine, raising fracture risk.
- Screw post systems increase stress concentration, leading to VRF.

#### Pathogenesis of VRF

- Cracks initiate at apical or coronal aspects and propagate through the root.
- Advanced VRF cases may result in total root separation.

#### Radiographic Features

- VRF can range from no pathological signs to significant separation of root fragments.
- J-shaped radiolucencies or halos are classic radiographic indicators of VRF.







#### **Definition & Classification**

- VRF is a longitudinal fracture in the root involving cementum, dentine, and root canal.
- Classified as incomplete (one side) or complete (both sides).



#### Common Occurrences

- Symptoms may appear 2 to 5 years after root canal treatment (RCT).
- Maxillary second premolar has the highest frequency of VRF, followed by maxillary first premolar and mandibular first molar.



- Residual sound tooth structure is crucial for fracture resistance.
- Pre-existing cracks and use of posts increase VRF risk significantly.



#### **Root Morphology Influence**

- Flattened roots with narrow cross-sections are more prone to fracture.
- Excessive force during obturation can lead to VRF.



#### **Clinical Presentation**

- Early VRF is difficult to detect; patients may show signs of apical periodontitis later.
- Symptoms include percussion tenderness, swelling, and pain on biting.

#### Visual Detection Techniques ← ▼

- Employ magnification and illumination for better visualization of VRF.
- Use of dye and fiber optic transillumination to enhance detection.

#### Radiographic Evaluation

- Periapicals and CBCT can be used for imaging, with CBCT providing higher acuracy.
- 7 CBCT identifies radiographic signs of periradicular bone loss indicative of VRF.

#### **Objectives of Treatment** ←

- Eliminate microbial ingress along the fracture line.
- Prevent the destruction of the periodontium.

#### **Prevention Measures**

- Comprehensive pre-operative assessments to evaluate factors affecting fracture resistance.
- Assessment of residual tooth volume, remaining walls, and root canal morphology is critical.

#### Pre-existing Cracks and VRF Relation

- Presence of pre-existing cracks in non-endodontically treated teeth can lead to pulp infection.
- Pre-existing cracks are a significant risk factor for developing VRF.

#### **Causes behind Pre-Existing Cracks**

- Factors include restorative treatments, parafunctional habits, and occlusal interferences.
- Cumulative general wear and post-root canal procedures contribute to crack formation.

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MIND MAP

## INVESTIGATION AND MANAGEMENT OF VRF



#### **Identifying VRF**

- A deep narrow pocket depth greater than 6mm is a key indicator of VRF.
- Use of narrow probes like UNC-15, PCP-12, or CLICK for accurate measurement.



#### **Confirmation of VRF**

- Removal of existing restorations can reveal fracture lines.
- Surgical exploration may be needed for confirmation, limited to buccal areas.

#### **Treatment Recommendation**

- Immediate treatment upon diagnosis of VRF to avoid complications.
- Extraction is often the preferred treatment method.

#### **Restorable Teeth Management**

- Aim to retain restorable teeth, primarily applicable for incomplete VRF.
- Root resection surgeries like amputation or hemisection as alternatives.



#### **Role of Occlusion in Prevention**

- Evaluate the patient's occlusion for parafunctional habits like bruxism.
- Occlusal splints may be fabricated to manage identified issues.



#### **Prevalence of Cracks in Population**

- More common in individuals aged 40-70, with a higher incidence in mandibular teeth.
- Cracks mostly occur in cervical and middle aspects of the root.







## **Question 1**

# What is a vertical root fracture (VRF)?



### Answer 1

Vertical root fracture (VRF) is a longitudinal (axial) fracture involving the cementum, dentine, and root canal system of a root.



Question 2

# How are vertical root fractures classified?



## Answer 2

Vertical root fractures are classified into three categories: Incomplete (involving one side of the root), Complete (extending from one proximal aspect to the opposite side), and Split tooth (showing visible separation of two components).



## Question 3

# Where are vertical root fractures most frequently observed?



### Answer 3

VRF is most frequently seen in root canal filled teeth, but they can also occur in teeth with vital pulps.



## Question 4

# What factors increase the risk of a vertical root fracture?



### Answer 4

Factors that increase the risk of VRF include the use of posts in root-filled teeth, pre-existing cracks, excessive force during obturation, and the shape of the root, such as flattened roots with a narrow mesio-distal cross-section.



## Question 5

# What are some symptoms associated with a progressing vertical root fracture?



### Answer 5

Symptoms of a progressing VRF may include tenderness to percussion, swelling, tooth mobility, pain on biting, and the presence of multiple sinus tracts.



## Question 6

# How can vertical root fractures be visually detected?



### Answer 6

To visually detect a VRF, magnification and illumination are essential, and confirmation may involve removing existing restoration and root filling materials to check for a fracture line.



## **Question 7**

# What radiographic signs can indicate a vertical root fracture?



## Answer 7

Radiographic signs of VRF may vary from no obvious pathology to periradicular bone loss, vertical bone defects, and classic J-shaped radiolucency.



## **Question 8**

What is the primary treatment option for a tooth diagnosed with a vertical root fracture?



## Answer 8

The primary treatment option for a tooth diagnosed with VRF is usually extraction, although root resection surgeries may be considered in certain situations.



## Question 9

# What preventive measures can be taken to reduce the risk of vertical root fractures?



### Answer 9

Preventive measures include comprehensive pre-operative assessments, conserving sound tooth structure during procedures, and addressing any parafunctional habits, such as bruxism.



## Question 10

What is the significance of pre-existing cracks in the context of vertical root fractures?



### Answer 10

Pre-existing cracks are a well-established predisposing factor for VRF, as they can propagate under repetitive occlusal loading, leading to fractures.



## **ENDODONTICS**

# PULP, DISEASE AND CLASSIFICATION



## MIND MAP & CUE CARDS



BY DR. JIGYASA SHARMA

#### Pathological Conditions ←

- Pulp disease refers to any condition affecting dental pulp, influenced by trauma, caries, or infections.
- These diseases can range from reversible to irreversible stages depending on severity.

#### Stages of Pulp Disease Progression

- Normal inflammation (pulpitis) could lead to necrosis, infection, and pulp degeneration.
- Changes can be acute or chronic, reversible or irreversible, with potential acute exacerbations.

#### Reversible Pulpitis ←

- This condition involves mild inflammation of the pulp that can be reversed if the irritant is removed.
- Symptoms include pain with stimuli, particularly with extreme temperatures.

#### **Treatment for Reversible Pulpitis**

- Conservative therapy includes removal of the cause and insulation of the expose d dentin.
- Successful management can lead to diminished symptoms and inflammation resolution.

#### Pain Characteristics of Irreversible Pulpitis 🗲 🔎

- Pain is sharp and often poorly localized at early stages and may relieve partially with cold application.
- Distinction between acute and chronic cases is critical for effective treatment.

#### **Radiographic Considerations**

- Radiographic changes may not be evident in the early stages but become visible as the disease progresses.
- Diagnosis can often rely on clinical findings rather than imaging for early pulpit is stages.



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## PULP, DISEASE & CLASSIFICATION



#### **Introduction to Dental Pulp**

- The dental pulp is the soft tissue inside the tooth that contains nerves and blood vessels.
- Pulp plays a crucial role in tooth vitality, sensory function, and responsiveness to stimuli.

#### **Classification of Pulp Diseases**

- Classification helps in accurate diagnosis and treatment determination.
- Categories include reversible pulpitis and irreversible pulpitis based on symptoms and damage extent.

#### **Normal Pulp Characteristics**

- A tooth with normal pulp is symptom-free and shows no radiographic pathosis.
- Responses to stimuli vary; mild/transient responses can occur with dentine sensitivity.

#### **Diagnosis of Reversible Pulpitis**

- Considered provisional; requires management and follow-up to ascertain normalcy or progression.
- A reliable review period is generally 3 months.

#### **Irreversible Pulpitis**

- This severe inflammatory process will not resolve despite treatment.
- Symptoms include lingering pain from thermal stimuli, often severe enough to interfere with sleep.

#### **Hyperplastic Pulpitis**

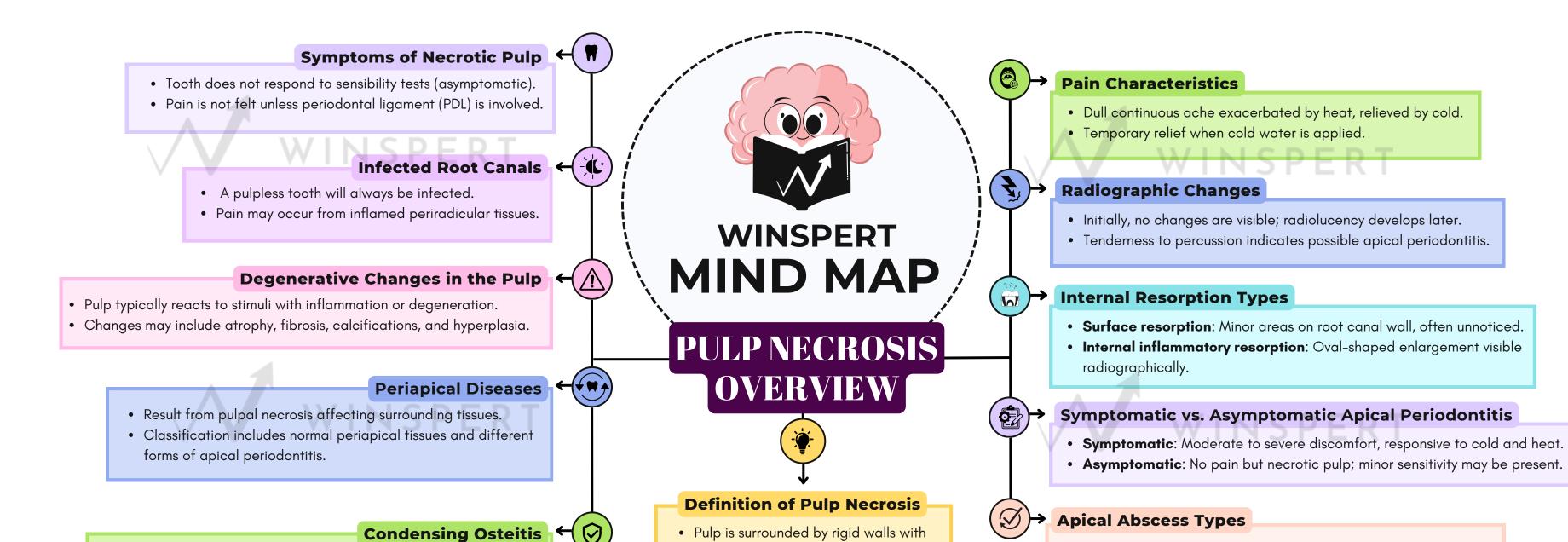
- Also known as pulp polyp; it results from chronic inflammation and appears as an overgrowth in young patients.
- Treatment options often include root canal therapy or extraction, particularly for symptomatic cases.



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no collateral blood flow.

liquefaction necrosis.

• Irreversible pulpitis can lead to

• Increase in trabecular bone due to chronic irritation.

• Radiographically characterized by diffuse radiopacity around root.

• Acute apical abscess (AAA): Localized pain and rapid onset.

• Chronic apical abscess (CAA): Long-standing lesion, typically

asymptomatic.

## Question 1

# What is the dental pulp and what role does it play in tooth health?

### Answer 1

The dental pulp is the soft tissue inside the tooth that contains nerves, blood vessels, and connective tissue. It plays a vital role in the tooth's vitality, sensory function, and response to stimuli.

## **Question 2**

# What is pulp disease and how is it classified?



### Answer 2

Pulp disease refers to any pathological condition affecting the dental pulp, which can range from reversible to irreversible stages. It is classified based on the severity of the condition, symptoms, and extent of damage, including categories like reversible pulpitis and pulp necrosis.

## Question 3

# What is reversible pulpitis and its characteristics?

### Answer 3

Reversible pulpitis is a clinical condition with mild inflammation in the pulp tissue. Symptoms are usually asymptomatic, with pain triggered by stimuli, especially cold, and pain ceasing immediately upon removal of the stimulus.

## Question 4

# How is irreversible pulpitis defined and what are its symptoms?



## Answer 4

Irreversible pulpitis is a severe inflammatory process that will not resolve even if the cause is removed. Symptoms include lingering pain induced by thermal stimuli or spontaneous pain that may disturb the patient, often worsening at night.

## **Question 5**

# What are the treatment options for irreversible pulpitis?

### Answer 5

For irreversible pulpitis, root canal treatment or extraction is usually recommended, especially for teeth showing significant symptoms.

### Question 6

# What is pulp necrosis and when should it be suspected?

#### Answer 6

Pulp necrosis occurs when the pulp dies, leading to liquefaction necrosis. It should be suspected when the tooth does not respond to pulp sensibility tests, and may sometimes be associated with dull continuous ache.

### Question 7

# What are the typical radiographic changes associated with pulp necrosis?



#### Answer 7

In early stages, no radiographic changes are seen, but within 2-10 months, radiolucency may develop, indicating periapical involvement due to necrosis.

## Question 8

# What are periapical diseases and how are they categorized?



### Answer 8

Periapical diseases are pathologic changes that occur in the periradicular tissues as a consequence of pulpal diseases. They can be categorized as normal periapical tissues, symptomatic apical periodontitis, asymptomatic apical periodontitis, condensing osteitis, and apical abscess.

## Question 9

# What is the difference between symptomatic and asymptomatic apical periodontitis?

#### Answer 9

Symptomatic apical periodontitis (SAP) involves moderate to severe spontaneous discomfort and sensitivity, while asymptomatic apical periodontitis (AAP) is clinically asymptomatic despite pulpal necrosis and may present with slight sensitivity to palpation.

## **Question 10**

# What is condensing osteitis and how does it appear radiographically?



#### Answer 10

Condensing osteitis is a variant of asymptomatic apical periodontitis characterized by increased trabecular bone in response to persistent irritation. Radiographically, it shows a diffuse concentric arrangement of radiopacity around the root of the tooth.



### **ENDODONTICS**

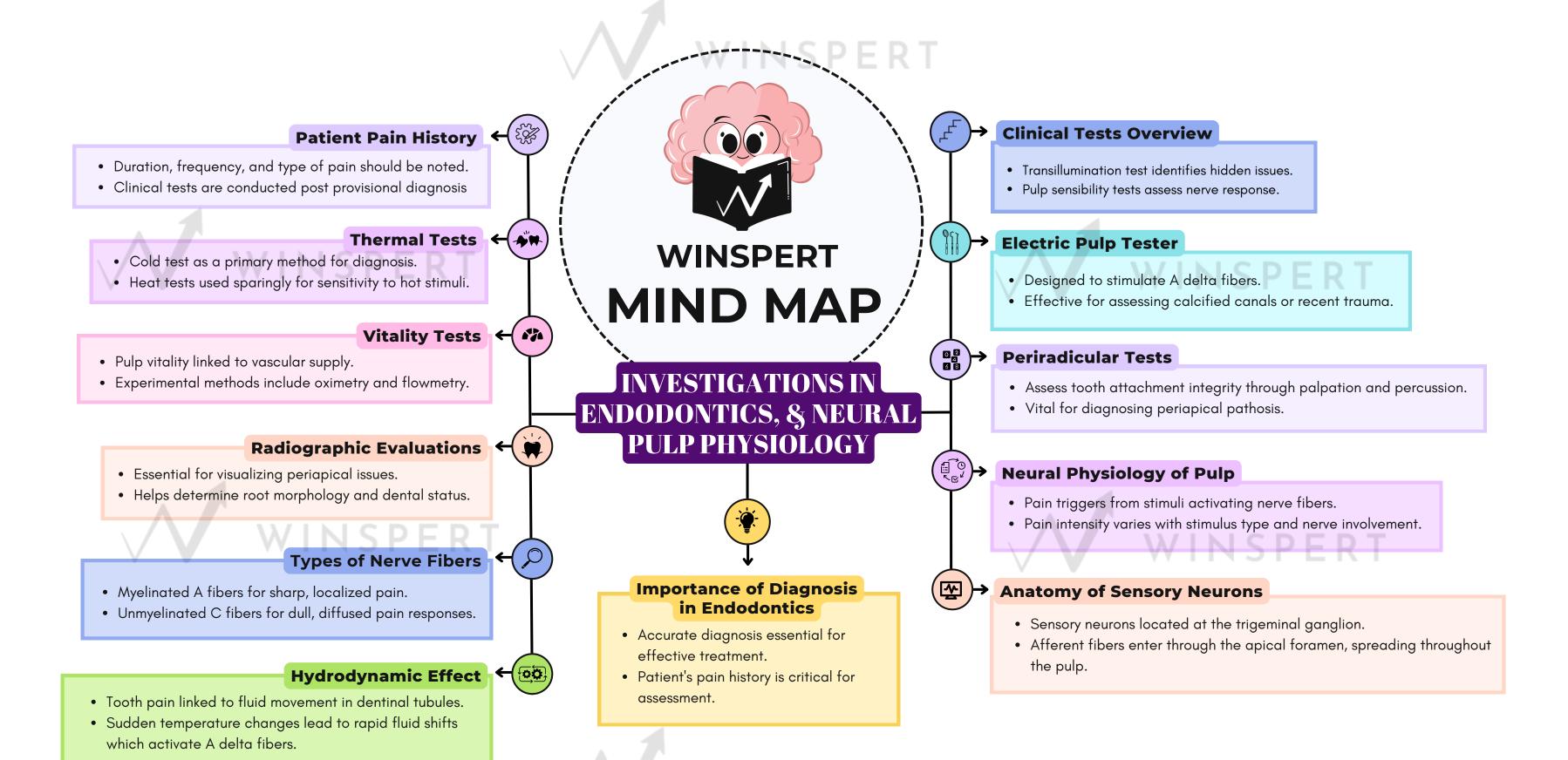
# INVESTIGATIONS IN ENDODONTICS, AND NEURAL PULP PHYSIOLOGY



MIND MAP & CUE CARDS



BY DR. JIGYASA SHARMA





## Question 1

# What is the purpose of diagnosis in endodontics?



#### Answer 1

The purpose of diagnosis in endodontics is to assess the condition of the tooth and provide appropriate treatment in a timely manner.



## Question 2

# What is the first clinical data a dentist must collect regarding a patient's pain?



#### Answer 2

The first clinical data to collect includes the type, duration, frequency, aggravating factors, effect of analgesic, and tenderness to biting.



### Question 3

# What initial examination is conducted after a provisional diagnosis in endodontics?



#### Answer 3

Clinical (intraoral and extraoral) and radiographic examinations are conducted to confirm the provisional diagnosis.



# Question 4

# What does the transillumination test in endodontics reveal?



### Answer 4

The transillumination test may reveal hidden decay or fractures in the tooth.



### **Question 5**

# What do pulp sensibility tests assess in endodontics?



#### Answer 5

Pulp sensibility tests measure the ability of pulp nerve fibers to respond to stimuli and determine if there is nerve response or not.



### Question 6

# How are thermal tests used in endodontic diagnosis?



#### Answer 6

Thermal tests depend on the outward and inward movement of dentinal fluid and help in diagnosing pulp vitality, particularly through cold or heat stimuli.



### **Question 7**

# What is the main function of the electric pulp tester in endodontics?



#### Answer 7

The electric pulp tester is designed to deliver electric current to stimulate the closest myelinated A delta fibers, helping to assess pulp vitality.



## **Question 8**

# What methods are available for measuring pulp vitality experimentally?



#### Answer 8

Experimental methods for measuring pulp vitality include pulp oximetry, laser Doppler flowmetry, and dual-wavelength spectrophotometry.



## Question 9

# What types of nerve fibers are found in the dental pulp?



#### Answer 9

The dental pulp contains myelinated A fibers (A delta and A beta) and unmyelinated C fibers, each responsible for different pain sensations.



## Question 10

# How do C fibers in the pulp influence the sensation of pain?



#### Answer 10

C fibers generate a slow, dull, and aching pain that is less excitable than A fibers and can survive in hypoxic conditions, affecting pain sensation during root canal preparation.



### **ENDODONTICS**

# MEDICAL LEGAL CONSIDERATIONS IN ENDODONTICS



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#### Challenges Faced by Dentists ← 🗑

- Patients often present with varying degrees of pain requiring careful management.
- Technical difficulties can arise from access, anesthesia, and anatomical complexities.

#### Role of Professional Organizations

- Organizations like ADA and ASE provide policy and position statements.
- These statements serve as benchmarks for clinicians to ensure compliance with standards of care.

#### Patient Treatment in Rural Areas

- Patients from rural areas may refuse to travel for specialist care.
- Temporary measures such as pain relief should be offered until definitive treatment is accessible.

#### Handling Patient Concerns about Dental Dam

- If a patient refuses dental dam due to medical or comfort issues, the dentist must explain its necessity.
- If the patient still declines, the dentist may need to refer them for further management.

#### Consent and Information Requirements

- Valid consent requires understanding of treatment information by the patient.
- Discussions should include reasonable options, alternatives, and material risks associated with procedures.







#### **Introduction to Endodontics**

- Endodontic procedures are technically challenging for dentists and unpleasant for patients.
- Complaints arising from endodontic treatment are more frequent compared to other areas in dentistry.



- There is no universal standard of care specific to every dental field.
- The goals of endodontics include pain elimination, infection management, and final restoration.

#### **Duty of Care**

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- Duty of care is consistent regardless of the practitioner's experience level.
- Rural dentists, despite fewer resources, are held to the same standards as metropolitan practitioners.

#### **Importance of Dental Dam in Endodontics**

- The use of dental dam is crucial for non-surgical endodontic treatment.
- Proper application prevents contamination of the operative field and reduces aerosol exposure.

#### Clinicians' Duty to Warn

- Clinicians must inform patients of risks and complications before treatment.
- Patients 18 and older can consent unless proven otherwise, with specified order for consent in incapacitated patients.

#### Conclustion

- Patients retain the right to make informed decisions regarding their treatment.
- Clinicians must ensure clear communication and documentation to uphold legal and ethical standards.





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#### Causes of Complaints ←

- Poor communication often leads to patient dissatisfaction.
- Valid consent requires clear information about risks.

#### Altered Sensation ←

- Altered sensation can range from temporary to permanent issues.
- Typically associated with treatment of mandibular molars and premolars.

#### Radiography in Endodontics $\leftarrow$

- At least three radiographs are necessary for effective treatment planning.
- CBCT scans can be used in conjunction with traditional radiography but are not a replacement.

#### Managing Difficult Patients (

- Empathy and attentive listening are vital for treating anxious patients.
- Dentists have the right to refuse treatment to aggressive patients.

#### **Importance of Referral**

- Referrals are a normal part of healthcare to ensure appropriate care.
- Clinicians must act within their training and skill scope.



# WINSPERT MIND MAP

# POSSIBLE COMPLICATIONS 8 PATIENTS RIGHT TO COMPLAIN



#### **Patients' Right to Complaint**

- Patients can directly complain to clinics or regulatory bodies.
- Complaints are prevalent in dentistry, especially in endodontics.



- Risk of treatment failure should be explained to patients.
- Instrument fractures are an inherent risk that needs addressing.

#### **Risk Mitigation Strategies**

- Pre-operative assessments are crucial to reduce potential risks.
- Use of electronic apex locators improves diagnostic accuracy.

#### Follow-up Responsibilites

- Dentists must follow up on patient recovery post-treatment
- Informing patients about the importance of follow-ups is essential.

#### Right to Refuse Treatment

- Patients can refuse treatment; dentists can also decline if it's justified.
- Patients should be informed about seeking second opinions.

#### **Legal and Professional Considerations**

- Legal advice may be necessary when terminating clinician-patient relationships.
- Indemnity insurance awareness is crucial for managing potential complaints.







# MEDICAL LEGAL CONSIDERATIONS IN ENDODONTICS

## Question 1

# What are the common challenges faced during endodontic procedures?



#### Answer 1

Endodontic procedures can be technically challenging for dentists and unpleasant for patients. Common challenges include access difficulties, anesthesia issues, and anatomical complexities, which can lead to patient complaints.



#### Question 2

# What is the standard of care in endodontics?



#### Answer 2

There is no published standard of care specific to every field of dentistry. The goals of endodontics include pain elimination, infection management, disinfection, filling of the root canal system, and final restoration.



#### Question 3

What is the role of position statements from professional organizations in endodontics?



#### Answer 3

Position statements from professional organizations serve as benchmarks for clinicians to ensure they practice within the expected standard of care, even though the ADA has no specific statements regarding endodontic treatment.



#### Question 4

# What is the importance of using a dental dam during endodontic procedures?



#### Answer 4

A dental dam is essential in endodontics as it reduces bacterial contamination, protects the patient's airway, and minimizes contaminated aerosols. Without it, instruments should not be introduced to the root canal system.



#### **Question 5**

# What should a dentist do if a patient refuses the use of a dental dam?



#### Answer 5

The dentist must explain the importance of the dental dam. If the patient still cannot or will not tolerate it, the dentist is responsible for declining to proceed with treatment and may need to refer the patient for specialist care.



#### Question 6

# What are the requirements for valid patient consent in medical procedures?



#### Answer 6

To gain valid consent, the patient must have the capacity to consent, understand the information provided, and be informed about all reasonable options, alternatives, and associated risks of the proposed treatment.



#### **Question 7**

What rights do patients have if they believe they have been subjected to malpractice in dentistry?



#### Answer 7

Patients have the right to make a complaint directly to the clinic, professional organizations, or regulatory bodies if they suffer harm or believe they have experienced malpractice.



#### **Question 8**

# What is the significance of follow-up appointments in endodontics?



#### Answer 8

Dentists have a duty to follow up with patients to ensure appropriate healing and manage complications. Patients must be informed of the importance of attending these appointments and the consequences of not doing so.



#### Question 9

# What is the dentist's responsibility regarding patient anxiety during treatment?



#### Answer 9

Dentists need to manage anxious patients with extra time and a calm approach. Empathy and listening skills are essential for making the patient comfortable during treatment.



#### Question 10

How should a dentist handle a situation where a patient demands treatment beyond the clinician's scope?



#### Answer 10

The dentist has the right to refuse treatment if it is not for discriminatory reasons. They must inform the patient about seeking a second opinion and facilitate the transfer of clinical information if necessary.



#### **ENDODONTICS**

# ENDODONTIC GUIDELINES IN NON-SURGICAL TREATMENTS



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#### Knowledge Requirements for General Dentists ←

- Essential knowledge for performing non-surgical root canal procedures.
- Importance of lifelong learning in endodontics.

#### Scope of Endodontics in Dental Practice $\leftarrow$

- Components of endodontic practice.
- Comprehensive approaches for non-surgical treatments.

#### Rationale for Case Difficulty Assessment |

- Reducing adverse outcomes and dentolegal issues.
- Responsibilities of practitioners in case referrals.

#### Examination Procedures in Endodontics

- Use of radiographs for root canal treatment.
- Benefits of Cone Beam Computed Tomography (CBCT).

#### **Clinical Approach for Access Cavity Preparation**

- Anatomical landmarks for accessing pulp chamber.
- Planning based on tooth anatomy and evaluation.



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# ENDODONTIC GUIDELINES IN NON-SURGICAL TREATMENTS



#### Introduction to Endodontic Treatment

- Importance of preserving natural dentition.
- Overview of ASE guidelines for root canal treatment.



#### **Integration with Specialist Endodontists**

- Referral to specialists in complex cases.
- Challenges in certain locations regarding specialist access.



#### **Diagnosis and Case Difficulty Assessment**

- Establishing accurate endodontic diagnosis.
- Importance of recognizing case difficulties.



#### **Quality Standards for Diagnosis**

- Documentation of definitive endodontic diagnosis.
- Integrating patient history with clinical examinations.



#### **Access Cavity Preparation**

- First step in non-surgical endodontic treatment.
- Importance of ideal access to root canal anatomy.



#### **Ensuring Proper Access and Cleaning**

- Rationale for adequate access cavity preparation.
- Importance of refining access for procedural success.

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# Facilitates removal of canal contents and irrigation penetration. Errors like ledges or perforations can negatively affect outcomes.

#### Quality Standards for Preparation

- Determine and maintain the accurate apical endpoint (working length).
- X Preparation should be confined to the root canal space only.

#### Mechanical Enlargement Importance ← ( ♠)

- Both hand and rotary instruments reduce microorganisms.
- Sterility isn't achieved solely through mechanical methods.

#### Properties of Ideal Irrigants ← (♥♥)

- No single irrigant possesses all ideal properties; combinations are necessary.
- Sodium Hypochlorite (NaOCI) is the primary irrigant for disinfection.

#### **Alternatives and Complements**

- EDTA is used after NaOCl to remove the smear layer.
- Chlorhexidine (CHX) offers good antimicrobial properties but not as a primary solution.



# ROOT CANAL PREPARATION & TREATMENT



#### **Objective of Root Canal Preparation**

- The goal is to disinfect and fill the root canal space.
- A tapered shape ensures resistance during filling.

#### **Minimum Canal Size Requirements**

- A canal size of at least 25 with a 0.06 taper is ideal.
- Adequate removal of debris is crucial for effective irrigation.

#### **Canal shaping and Considerations**

- Canal preparation varies per tooth's unique anatomy.
- Preserving coronal dentin is vital to avoid perforations.

#### **Clinical Approach for Irrigation and Medicaments**

- Primary function is to prevent infections and biofilms.
- Provides lubrication, flushes debris, and removes smear layers.

#### Sodium Hypochlorite Usage

- Recommended concentration is between 0.5-6%.
- Refreshing and agitation enhance its effectiveness.

#### **Risks and Precautions**

- Avoid excessive pressure during irrigation.
- Understanding material interactions, especially between NaOCl and CHX, is essential for patient safety

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#### Ultrasonic Irrigation Techniques 🗲 🌹

- EndoActivator and Vibringe for targeted cleaning.
- Increased effectiveness in tissue dissolution from active irrigation.

#### Importance of Root Canal Obturation

- Objective: Minimize space to prevent microorganism persistence.
- Rationale: Barrier to nutrients and microbes for long-term success.

#### Clinical Techniques for Obturation ←(♠)

- Cold lateral compaction as a widely used method.
- Thermal and solvent-softened techniques for compaction.

#### Restoration of Root Canal Treated Teeth

- Objective: Restore function and aesthetic appearance.
- Rationale: Prevent complications such as re-contamination and fractures.

#### **Recall and Outcome Assessment**

- Regular assessments post-treatment for expected outcomes.
- Importance of identifying complications and planning further management.



#### RRIGATION SYSTEM 8 ROOT CANAL TREATMENT



#### **Methods of Irrigation**

- Traditional techniques (needle and syringe, with side-vented needles)
- Advanced methods (machine-driven systems, automatic pumps, and ultrasonic techniques)



- Endo Vac for safer irrigation at the apical canal.
- Reduced risk of solution extrusion compared to positive pressure techniques.

#### **Obturation Materials**

(A)

- Gutta-Percha (GP) common material with low toxicity.
- Role of sealers to fill minor spaces within the canal system.

#### **Single Cone Technique**

- Recent increase with engine-driven systems.
- Proper apical termination is crucial for effective sealing.

#### **Quality Standards for Restoration**

- Timely placement of definitive restorations.
- Assessment of previous restorations based on clinical evaluations.

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#### **Question 1**

# What is the primary objective of endodontic treatment?



#### Answer 1

The primary objective of endodontic treatment is to preserve the natural dentition through the prevention and/or treatment of pulpal and periradicular pathosis.



#### Question 2

Who developed the guidelines for contemporary practice standards in root canal treatment?





#### Answer 2

The guidelines for contemporary practice standards in root canal treatment were developed by the Australian Society of Endodontology Inc. (ASE).



#### Question 3

# What is essential before initiating root canal treatment?



#### Answer 3

Before initiating root canal treatment, a definitive endodontic diagnosis should be documented, and the restorability of the tooth should be assessed.



#### Question 4

What is the rationale for conducting a case difficulty assessment prior to treatment?



#### Answer 4

Recognizing and understanding case difficulties prior to treatment can reduce adverse outcomes for the patient and mitigate the risk of dentolegal problems for dental practitioners.



#### Question 5

# What is the recommended isolation technique during root canal treatment?



#### Answer 5

The recommended isolation technique during root canal treatment is the use of a rubber dam.



#### Question 6

# What is the main purpose of root canal irrigation during treatment?



#### Answer 6

The primary purpose of using root canal irrigants during treatment is to treat and prevent the recurrence of infection and biofilms within the root canal system.



#### **Question 7**

# Why is sodium hypochlorite used as a primary irrigant in root canal preparation?



### Answer 7

Sodium hypochlorite is used as a primary irrigant because it disinfects and dissolves organic material in the root canal.



## Question 8

## What should be the termination point of root canal obturation?



### Answer 8

Root canal obturation should terminate within 0-1mm from the working length (WL) and should be well compacted.





## Question 9

## What is the objective of restoring root canal treated teeth?



### Answer 9

The restoration of root canal treated teeth aims to return the tooth to aesthetic and occlusal function and to prevent subsequent complications.



## Question 10

## What is the importance of regular recall appointments after root canal treatment?



### Answer 10

Regular recall appointments after root canal treatment are necessary to assess whether the procedure has led to the expected outcome and to identify possible complications.



## **ENDODONTICS**

## ENDODONTIC EMERGENCIES



MIND MAP & CUE CARDS



BY DR. JIGYASA SHARMA

#### Pain Mechanism ←

- Chemical mediators activate nociceptors causing pain.
- Pressure from edema increases fluid pressure, stimulating pain receptors.

#### Types of Endodontic Emergencies ←

- Pre-treatment emergencies present severe pain and swelling at initial visit.
- & Interappointment and Post-obturation emergencies (flare-ups) occur post-appointment.

#### **Pre-treatment Emergencies Classification**

- Without Symptomatic Apical Periodontitis
- i. Complete root canal treatment is ideal if time permits.
- ii. Pulpotomy is effective when time is minimal.
- With Symptomatic Apical Periodontitis
- i. Partial or total pulpectomy recommended for extreme tenderness.
- ii. Reducing occlusion can help relieve symptoms.
- Pulp Necrosis with Apical Pathosis
- i. *Treatment is biphasic*: remove pulp irritants and relieve apical fluid pressure.
- ii. Pain can vary with or without swelling.

#### Localized vs. Spreading Odontogenic

- Localized Infection
- i. Causes dental pain without facial swelling; antibiotic treatment not required.
- Spreading Infection
- i. Facial swelling without systemic features indicates need for oral antibiotics and urgent dental treatment.









#### **Definition and Overviews**

- Endodontic emergencies involve pain and/or swelling requiring urgent diagnosis.
- They are caused by irritants leading to inflammation in the pulp or periradicular



- Reduce chemical mediators concentration.
- Allow pressure release from root canal and periapical regions.

#### **Differentiating Emergencies**

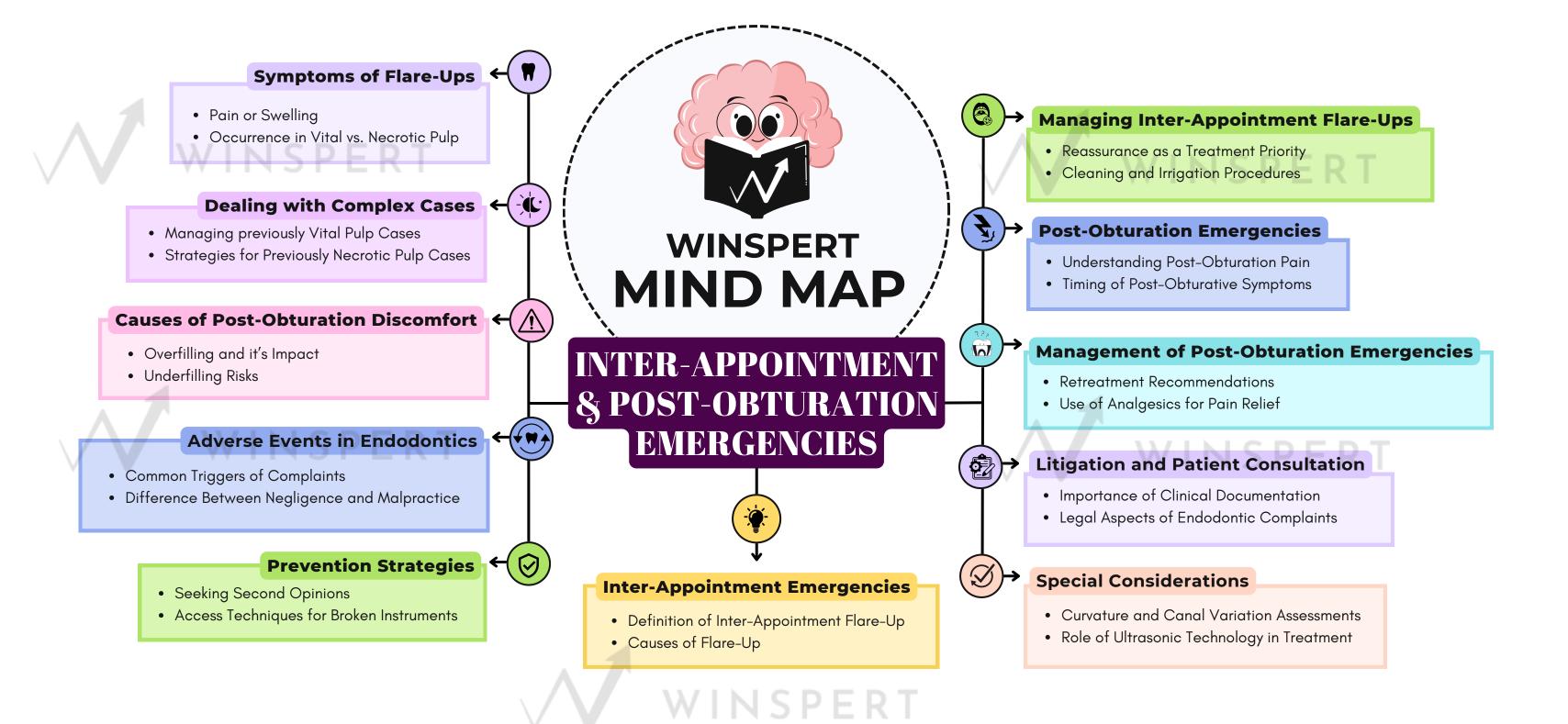
- True emergencies require immediate unscheduled visits.
- Urgencies can be scheduled at convenience for less severe issues.

#### **Pulp Necrosis Complications**

#### Without Swelling

- **Nithout Swelling**i. Vital inflamed tissues or formed abscess confined in bone may occur; root canal treatment necessary.
- With Localized Swelling
  - i. Abscess may invade soft tissues; debridement and drainage essential.
  - ii. Incising localized swelling to relieve pressure and remove purulence is crucial.
- With Diffuse Swelling
  - i. Rapidly progressive cellulitis may develop, indicating urgency.
  - ii. Hospital transfer is needed for severe cases with systemic features.

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## Question 1

# What are the common symptoms associated with endodontic emergencies?



#### Answer 1

Endodontic emergencies are usually associated with pain and/or swelling and require immediate diagnosis and treatment.



## **Question 2**

## What are the main causes of pain in endodontic emergencies?



### Answer 2

Pain results from two factors related to inflammation: chemical mediators activating nociceptors and pressure from increased fluid volume in the pulp or periradicular tissues.



## Question 3

# How can the pain associated with endodontic emergencies be treated effectively?



#### Answer 3

Reducing the concentration of chemical mediators and allowing release of pressure from the root canal system and periapical region are effective treatment measures.



## Question 4

# What distinguishes a true emergency from a less critical urgency in endodontic cases?



### Answer 4

A true emergency requires an unscheduled office visit due to the severity of the problem, while urgency indicates a less severe issue that can be scheduled for a convenient time.



## Question 5

## How is a pretreatment emergency characterized?



### Answer 5

A pretreatment emergency involves severe pain and swelling when the patient is initially seen, complicating both diagnosis and treatment.



## Question 6

# What should be done in cases of pulp necrosis with localized swelling?



#### Answer 6

The treatment is biphasic, involving debridement of the canal(s) and incision for drainage to relieve pressure and pain.



## **Question 7**

## What common event can lead to complaints following endodontic treatment?



### Answer 7

The most common events leading to complaints include broken instruments (24%), perforations (22%), and adverse reactions to irrigants or medicaments (5%).



## Question 8

What is the importance of immediate patient communication if an instrument separation occurs during treatment?



### Answer 8

The patient should be informed of the incident and referred to an endodontist for management without delay.



## Question 9

What is the recommended action if a patient experiences a flare-up after a dental appointment?



### Answer 9

Patients experiencing a flare-up should be reassured, evaluated for their temporary restoration, and may require re-checking of the working length and cleaning of the canal.



## Question 10

# What is often the cause of post-obturation pain and how should it be managed?



### Answer 10

Post-obturation pain is commonly caused by overfilling and usually resolves spontaneously; management typically involves reassurance and analgesics.



## **ENDODONTICS**

## ENDODONTIC RESTORATIONS AND POSTS



MIND MAP & CUE CARDS



BY DR. JIGYASA SHARMA

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#### Structural Compromise After Treatment ←

- Teeth may become structurally compromised post-therapy.
- Restorative procedures restore strength and integrity.

#### Significance of Proper Restoration ← C

- Successful endodontic treatment relies on effective restorative measures.
- Leaking restorations reduce treatment success rates dramatically.

#### Influence of Patient-Related Factors

- Factors like occlusal patterns and bruxism affect restoration choices.
- Dietary habits can lead to restoration fractures.

#### **Full Crown Restoration**

- Recommended when significant tooth structure is missing.
- Provides a long-term restoration solution.

#### **Core Build-Up Procedures**

- Core build-up required before crown placement.
- Use self-curing adhesive and core build-up composite.

#### **Advantages of Fiber Reinforced Posts**

- Research supports fiber-reinforced posts' superiority when indicated.
- Enhances the overall success of endodontic restorations.



WINSPERT MIND MAP

## SENDODONTIC RESTORATIONS & POSTS



#### Importance of Endodontic Restorations

- Restorations ensure functionality and longevity of treated teeth.
- Protects teeth from further damage after root canal therapy.



#### **Requirement for Coronal Restoration**

- All orthograde treatments necessitate restoration of the coronal cavity.
- The type of restoration depends on the residual tooth structure.



- Direct Composite Restoration
  - i. Most stable when all four walls of the access cavity are intact.
- ii. Recommended when 3 or 4 coronal walls are preserved.
- Flowable Bulk-Fill Composites
  - i. Preferred for low shrinkage and self-adaptive properties.
  - ii. Performance varies among commercially available materials.



#### **Cuspal Coverage**

- Suggested when coronal walls or cusps are undermined or lost.
- Typically performed with adhesive composites or ceramic overlays.



#### **Ferrule Preparation in Crowns**

- A circumferential ferrule of 1.5–2mm is crucial for durability.
- Crown lengthening procedures may be necessary if ferrule cannot be achieved.



#### **Post Placement Considerations**

- Posts improve retention in teeth with substantial crown loss.
- Various posts available: metallic, cast, fiber-reinforced, and zirconia.

#### Ease of Use ←

- Simplifies post-endodontic restoration by eliminating lab steps.
- Relatively easy to remove for retreatment if necessary.

#### Adhesive Luting of Fiber Posts ←

- Adhesive cement is crucial for clinical performance.
- A Failure mode primarily due to post debonding.

#### Recommendations for Luting Agents

- Avoid post luting with ZOE sealers immediately after obturation.
- Best results with etch and rinse adhesive combined with dual care resin cements.

#### Types of Fiber Post Categorization

• Glass fiber posts, carbon fiber posts, quartz fiber posts, polyethylene fiber posts.

#### Radiopacity of Fiber Posts

- Glass fiber posts: most radiolucent; quartz fiber posts: slightly less so.
- Carbon fiber posts: more radiopaque than glass but less than metal/zinc.

#### References

 Based on literature review from AAE (American Association of Endodontics) in the Journal of Endodontics.



## WINSPERT MIND MAP

## FIBER REINFORCED COMPOSITE POSTS



#### **Composition and Structure**

- Made of carbon, quartz, or glass fibers within an epoxy or methacrylate resin matrix.
- Silanization enhances adhesion between fibers and resin



- Available shapes: cylindrical, cylindroconical, conical, double tapered.
- Double tapered posts minimize dentine removal in endodontically treated teeth.

#### **Advantages of Fiber Posts**

- Elastic modulus similar to dentine for uniform stress distribution.
- Cost-effective and aesthetically pleasing compared to other post materials.

#### **Performance and Reliability**

- Glass fiber posts show lower failure rates and stress peaks in finite element analysis.
- Superior optical properties that mimic natural teeth.

#### **Challenges in Adhesion**

- Endodontic irrigants and remnants affect luting agents.
- Careful debridement with ultrasonic instruments is needed for better adhesion.

#### **★**

#### **Curing Modes**

- Light cure materials not recommended due to penetration difficulties.
- Dual care resins recommended to ensure proper cement polymerization.



#### **Surface Treatment for Adhesion**

- Silanization enhances adhesion but is ineffective for carbon fiber posts.
- Hydrogen peroxide treatment improves adhesion for resin composite.



#### Conclusion

• Understanding types, advantages, and effective use of fiber reinforced composite posts is essential for successful endodontic treatments and restorations.

#### 

#### ENDODONTIC RESTORATIONS AND POSTS

## **Question 1**

## What are endodontic restorations and posts used for?

#### ENDODONTIC RESTORATIONS AND POSTS

#### Answer 1

Endodontic restorations and posts are critical components in the rehabilitation of endodontically treated teeth, ensuring their functionality and longevity after root canal therapy.

#### ENDODONTIC RESTORATIONS AND POSTS

## Question 2

## Why is coronal restoration important after endodontic treatment?



# Answer 2

Coronal restoration is important because leaking restorations dramatically reduce the chance of endodontic treatment success and are vital for maintaining apical periodontal health.

# Question 3

What type of restoration is recommended when at least three out of four coronal walls are intact?



# Answer 3

A direct composite restoration is recommended when at least three or four coronal walls are intact, along with at least one marginal ridge.

# Question 4

What materials are typically chosen for restoring endodontically treated teeth directly?

# Answer 4

Flowable Bulk-Fill composites are typically chosen due to their low shrinkage stresses and self-adaptational properties.

# **Question 5**

# What is cuspal coverage and when is it recommended?

# Answer 5

Cuspal coverage involves restoring teeth with few or undermined coronal walls without full crown placement and is recommended in cases where there is a loss of marginal ridges or cusps.

# Question 6

What is the importance of creating a circumferential ferrule when preparing a full crown?



# Answer 6

Creating a circumferential ferrule is important because it provides fracture resistance to endodontically treated teeth and is recommended to be 1.5-2mm for effective support.

# **Question 7**

# What is the role of a root post in an endodontically treated tooth?



# Answer 7

A root post is used to improve the retention of coronal restoration in an endodontically treated tooth, especially when there is extensive loss of crown structure (more than 50%).

# **Question 8**

What are the advantages of fiber reinforced composite posts over other types of posts?



# Answer 8

Fiber reinforced composite posts have similar elasticity to dentin, ensuring uniform stress distribution, and they are easier to place, more aesthetic, and simpler to remove if endodontic retreatment is necessary.



# Question 9

# What factors can affect the adhesion of fiber posts?

# Answer 9

Endodontic irrigants, remnants of plasticized gutta-percha, and the presence of sealer residues can negatively affect the adhesion of fiber post cementation and retention.

# Question 10

# How can the bond strength of resin composites to fiber posts be improved?



# Answer 10

The bond strength can be improved through methods such as silanization of quartz and glass fiber posts, pretreatment with hydrogen peroxide, and silicoating the substrate.



# **ENDODONTICS**

# ENDODONTIC FAILURE



MIND MAP & CUE CARDS



BY DR. JIGYASA SHARMA

#### Lack of Proper Apical Seal ← 🗑

- Bacteria and tissue debris may remain during cleaning
- Sealing irritants during obturation can lead to inflammation.

#### Importance of Lateral Seal ←

- Lateral canals can allow irritants from the canal to the lateral periodontium.
- Establishing a lateral seal, while important, is less critical than apical and coronal seals.

#### Overfills of the Canal +

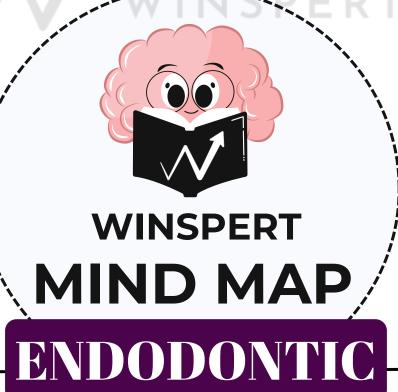
- Overfills lead to increased inflammation and delayed healing.
- Caused by over-instrumentation or improper taper during preparation.

#### Treatment for Overfills ← ♥♥

- Apical surgery may be needed to remove extruded material.
- Long-term prognosis relies on the quality of the apical seal.

#### **Prevention of Underfills**

- Creating a smooth funnel-shaped taper helps avoid barriers
- Use of nickel titanium rotary files with increased taper improves predictability.





**FAILURE** 

#### **Causes of Endodontic Failure**

- Loss of or inadequate coronal seal
- Inadequate debridement and disinfection
- Missed canals and vertical root fractures
- Significant periodontal disease
- Coronal fractures and poor aseptic technique
- Procedural errors (loss of length, ledging, zipping, perforations)



#### **Importance of Coronal Seal**

- A good coronal seal prevents irritants from accessing periapical tissues
- Exposure of gutta-percha to saliva increases the risk of treatment failure.
- Duration of exposure requiring retreatment is variable.



- Inform patients about incidents and necessary corrections.
- Document incidents for medicolegal purposes.

#### **Prevention of Overfills**

- Proper tapering of canals creates an adequate matrix for compaction.
- Minimal extrusion of sealer will generally resolve irritation issues.

# **♠**

#### **Underfills of Canals**

- Occurs when preparation and obturation do not reach desired length.
- Optimal lengths for necrotic pulps: 0.5 to 1 mm short of apex; vital pulps: 0 to 2 mm short.



#### **Treatment for Underfills**

- Removal of underfilled gutta-percha and retreatment is preferred.
- Increasing spreader or plugger pressure can fracture the root.



#### Causes of Perforations ←

- Pulp system is aligned with the tooth's long axis
- Misalignment due to lack of attention to tooth inclination can cause gouging.

#### Prevention Strategies ←

- Knowledge of tooth morphology is crucial for preventing perforations.
- Use radiographs to determine pulp chamber size and state.

#### Imaging Techniques (

- Different angulations of radiographs help uncover canal locations.
- Magnification tools assist in visualizing canal orifices.

#### Treatment of Perforations ←

- Referral to an endodontist is advisable for management.
- Surgical retreatment may be necessary if initial treatment fails.

#### Repairing Furcation Perforations

- Non-surgical options preferred when feasible.
- Immediate sealing with MTA provides better outcomes.

#### **Prognosis and Treatment Considerations**

- Immediate repair improves prognosis for both lateral and furcation perforations.
- Surgical options like hemisection may be considered for complex cases.



# PERFORATIONS DURING

ACCESS CAVITY PREPARATION



#### **Objective of Access Cavity**

- Ensures a straight-line pathway to the apical foramen
- Accidents like excess tooth structure removal may occur



- Underprepared access may lead to search-related accidents.
- Failing to identify the size or shape of the pulp chamber can result in errors.

#### **Tools for Prevention**

- Safe-ended access burs reduce the risk of perforation.
- Apex locators aid in early detection of perforations.

#### **Signs of Perforation**

- Sudden pain during treatment may indicate a perforation.
- Persistent hemorrhage is a key symptom to watch for.

#### **Managing Lateral Canal Perforations**

- Prognosis varies based on perforation location relative to crestal bone.
- MTA is the preferred material for repair due to effective sealing capabilities.

#### **Types of Furcation Perforations**

- Direct perforations are immediate and manageable with MTA.
- A Stripping perforations often require complicated surgical interventions.

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#### Causes of Ledge Formation $\leftarrow$

- Inadequate access to the canal.
- Lack of irrigation or lubricationion.
- Excessive enlargement of curved canals
- Packing debris in the apical portion of the canal.

#### Treatment of Ledge Formation <

- Attempt to bypass the ledge with a No. 10 steel file.
- Use bending and reaming motions to navigate back to the original canal.
- If bypass fails, clean and shape to the new working length.

#### What is Artificial Canal Creation

- Deviation from the original canal pathway leading to an exaggerated ledge.
- Initiated by the same factors causing ledging; aims to regain lost working length.

#### Treatment of Artificial Canals

- Negotiating the original canal with exaggerated ledges is difficult.
- Rarely possible to renegotiate and prepare.

#### Prevention of Apical Perforations +

- Proper working lengths and file flexibility considerations are critical.
- Verification with an apex locator after cleaning and shaping.

#### **Lateral and Coronal Root Perforations**

- Main cause: inability to maintain canal curvature.
- Occurs during access preparation or flaring procedures.

#### Complications from Instrumentation ←

- Avoid aspiration or ingestion of instruments through proper techniques.
- Be cautious with irrigation to prevent harmful extrusion of fluids.



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# MIND MAP

# LEDGE FORMATION S RELATED

COMPLICATIONS IN ENDODONTICS



#### **Summary of Key Points**

- Understanding pre-emptive measures and treatment options is essential in endodonicts.
- Emphasis on thorough techniques and careful handling of instruments can greatly influence outcomes.



- A ledge is created when the working length cannot be negotiated.
- Original patency of the canal is lost.



- Use preoperative radiographs to assess canal characteristics.
- Carefully determine working length to avoid short measurements.
- Pay attention to longer, curved, and smaller diameter canals while shaping.



- Depends on the debris left in the untreated canal portion.
- Cleaned apical ledges generally have better prognosis.

#### **Prevention of Artificial Canal Creation**

• Avoid practices leading to ledge formation to prevent artificial canals.

#### **Root Perforations and their Causes**

- Different levels and stages affect prognosis.
- Apical perforation from over-instrumentation or incorrect working length.

#### **Treatment of Apical Perforations**

- Establish a new working length and obturate the canal accordingly.
- Use MTA as an apical barrier to prevent material extrusion.

# → Preventio

#### **Prevention of Coronal Root Perforations**

• Follow the same preventive measures as for other perforations.

#### → Vertical Root Fractures

- Complete vertical root fractures are often untreatable and lead to failure.
- E Refer to H.O.T notes for detailed management strategies.

# **₩**





# Question 1

# What are some common causes of endodontic failure?



# Answer 1

Common causes of endodontic failure include loss of or inadequate coronal seal, inadequate debridement and disinfection, missed canals, vertical root fractures, significant periodontal disease, coronal fractures, poor aseptic technique, and procedural errors such as loss of length, ledging, zipping, and perforations.



# Question 2

# Why is a proper apical seal important in endodontic treatment?



# Answer 2

A proper apical seal is important because it prevents irritating substances like bacteria and tissue debris from escaping into surrounding tissues. If sealed improperly, these irritants can lead to inflammation and treatment failure.





# Question 3

# What role does a coronal seal play in preventing endodontic failure?



# Answer 3

A coronal seal is crucial as it prevents access of oral cavity irritants, such as microorganisms and chemicals, to the periapical tissues, which can cause inflammation and treatment failure if allowed to infiltrate.





# Question 4

# What are the consequences of overfilling a canal during endodontic treatment?



# Answer 4

Overfilling a canal can cause increased inflammation, delayed healing, and post-obturation discomfort. It typically results in inadequate apical seal and irritation from the extruded material.





# **Question 5**

# What are the common causes of underfilling in endodontic treatment?



# Answer 5

Underfilling typically occurs due to natural barriers in the canal, ledge formation during preparation, insufficient flaring, poorly adapted master cones, or inadequate condensation pressure.





# Question 6

# How can procedural accidents during root canal treatment lead to endodontic failure?



# Answer 6

Procedural accidents can lead to endodontic failure by causing issues like perforations, incomplete debridement, or disinfection, all of which can compromise the overall success of the treatment.



# **Question 7**

# What is ledge formation, and what causes it?



# Answer 7

Ledge formation is the creation of a ledge in the canal where the working length can no longer be negotiated, typically caused by inadequate straight-line access, excessive enlargement of curved canals, or packing debris in the apical portion of the canal.





# **Question 8**

What is the significance of detecting perforations early during endodontic treatment?



## Answer 8

Early detection of perforations is crucial as it allows for immediate corrective action to be taken, minimizing damage and improving the prospect for nonsurgical repair and successful treatment.





## What are the treatment options for furcation perforations?



#### Answer 9

For furcation perforations, non-surgical repair is preferred when feasible, with immediate sealing with MTA yielding the best results. If inaccessible, surgical interventions such as hemisection or intentional replantation may be necessary.



## Question 10

What preventive measures can be taken to avoid extrusion of irrigation solutions during endodontic treatment?



## Answer 10

To prevent extrusion of irrigation solutions, it is important to use properly placed irrigation needles and apply light pressure during irrigation. Monitoring for signs of discomfort can also help prevent complications related to solution penetration into periradicular tissues.



## **ENDODONTICS**

## COMBINED LESIONS



MIND MAP & CUE CARDS



BY DR. JIGYASA SHARMA

#### Communication Pathways +

- Various anatomical and pathological pathways exist between dental pulp and periodontium.
- The apical foramen is the main route for bacterial travel.

#### **Lateral and Accessory Canals**

- Small channels form communication between pulp and periodontal tissues.
- 30–40% of teeth may have these canals, primarily in the apical third.

#### Cementum and Periodontal Health

- Cementum acts as a barrier; its absence exposes dentinal tubules.
- Issues such as gum disease or trauma can damage cementum, facilitating bacterial travel.

#### Non-Anatomical Pathways ← (\*\*\*)

- Pathological conditions can create non-anatomical communication between the areas.
- latrogenic causes include damage from endodontic or restorative procedures

#### **Effects of Endodontic Lesions on Periodontal Tissues**

- Infected pulp triggers inflammation in periodontal tissues near communication sites.
- Effective endodontic treatment typically resolves inflammation when periodontal health is intact.

#### Classification of Endodontic and Periodontal Lesions

- Lesions categorized based on the origin of infection (e.g., primary periodontal disease).
- Clinical findings include widening pockets and gingival recession as the disease progresses.



MIND MAP

COMBINED LESIONS:





- Endodontic and periodontal diseases exhibit similar signs.
- Determining the correct diagnosis is often complicated.

#### **Apical Foramen**

- Principal communication route between pulp and periodontium.
- Allows for bacteria transmission from root canal to periapical tissues in cases of periodontal disease.

#### **Dentinal Tubules**

- Dentin's structure permits communication due to dentinal tubules.
- Enamel and cementum provide exterior protection to limit tubule permeability.

#### **Developmental Grooves and Malformations**

- Radicular grooves can create pathways between pulp and periodontium.
- These grooves complicate oral hygiene for patients and are typically hard to clean.

#### **Etiological Factors in Endo-Perio Lesions**

- Bacteria, fungi, and foreign bodies can cause lesions in periodontal tissues.
- Poor endodontic treatments contribute to reinfection and subsequent inflammatory reactions.

#### **Periodontal Disease Impact on Pulp**

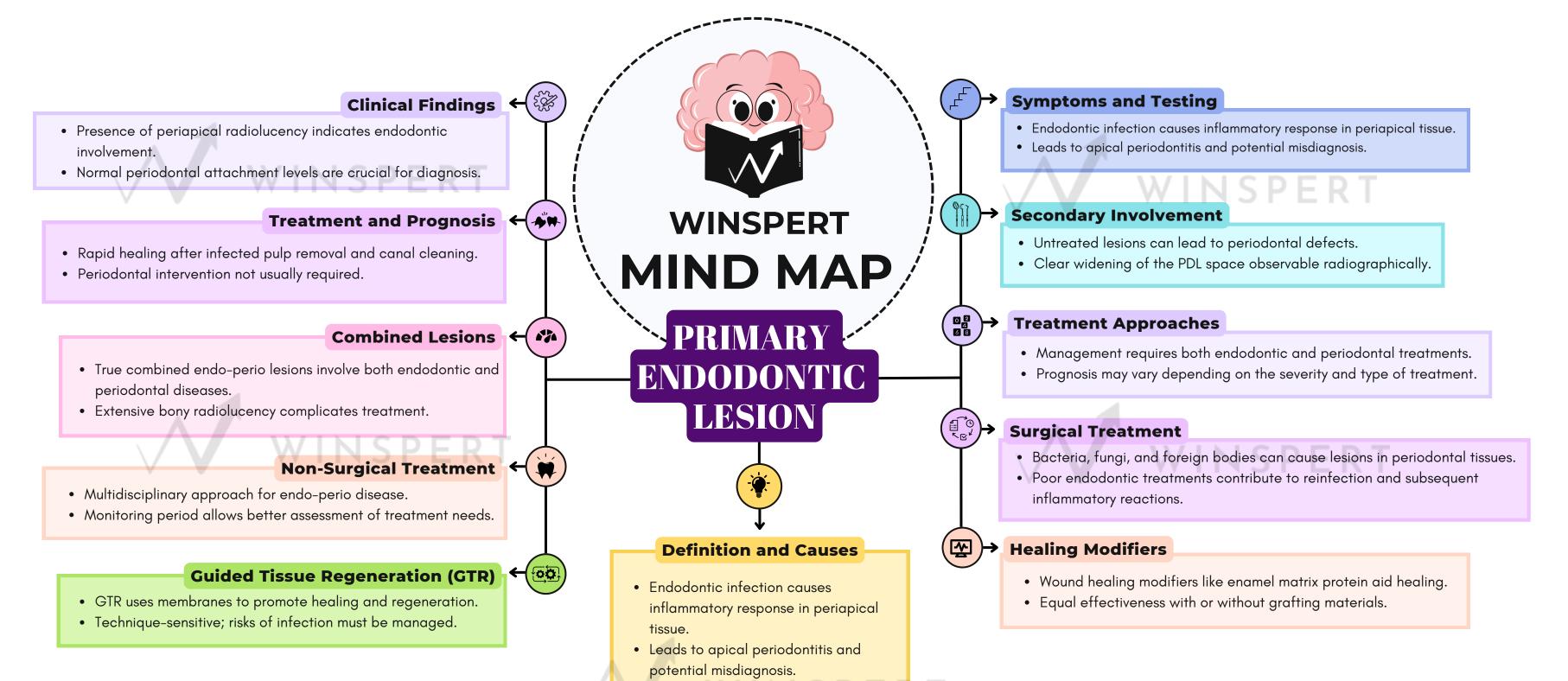
- Periodontal disease doesn't severely affect pulp until it reaches the apex.
- Most cases of periodontal disease do not impact pulp unless extensive progression occurs.

#### **Prognosis and Treatment**

- Prognosis relies on periodontal disease stage and treatment effectiveness.
- For primary periodontal with secondary endodontic lesions, combined treatment of both areas is essential.

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What challenges are associated with diagnosing combined lesions of endodontic and periodontal diseases?





Diagnosis can be challenging because endodontic and periodontal diseases can sometimes present with very similar signs and symptoms.





What factors influence the treatment and prognosis of endodontic-periodontal diseases?





The treatment and prognosis depend on the etiology and correct diagnosis of the specific condition.





What is the principal route of communication between the dental pulp and the periodontium?





The principal route of communication is the apical foramen.





How do lateral and accessory canals contribute to the communication between pulp and periodontal tissues?





Lateral and accessory canals serve as small branches of communication, estimated to exist in 30% to 40% of all teeth, allowing potential pathways for bacteria and irritants.





What role do dentinal tubules play in the communication between pulp and periodontium?





Dentinal tubules, being permeable, can potentially allow communication between the pulp and periodontium, especially if the protective layers are compromised.





# What is the effect of primary periodontal disease on teeth with healthy pulps?





In teeth with only periodontal disease, the pulp is usually not severely affected unless the defect reaches the apex, which can lead to infection and necrosis.





## What happens if primary endodontic lesions are left untreated?





Untreated primary endodontic lesions can lead to continued suppuration and may cause secondary involvement with periodontal defects due to plaque and calculus.





What are the characteristics of true combined lesions in endodontic-periodontal diseases?





True combined lesions occur when an endodontic disease progressing coronally joins with a concurrent or unrelated infected periodontal pocket progressing apically.





What is guided tissue regeneration (GTR) in the context of surgical treatment for endodontic-periodontal diseases?





GTR is a regenerative treatment that places a membrane to act as a barrier during healing, preventing connective tissue and epithelial cells from entering the infra bony defect, allowing for proper regeneration.





How does the prognosis vary for single-rooted versus multi-rooted teeth with endodontic-periodontal lesions?





The prognosis is generally poor for single-rooted teeth with apico-marginal defects, while for multi-rooted teeth, it varies based on the periodontal status and response to treatment.



## **ENDODONTICS**

## INTERNAL BUEACHING



MIND MAP & CUE CARDS



BY DR. JIGYASA SHARMA



- Pulp necrosis causes colored compounds to stain dentin.
- Intrapulpal hemorrhage can lead to discoloration from blood vessel injury.

#### Calcific Metamorphosis ←

- Formation of irregular dentin due to impact injury.
- Internal bleaching is an option after external bleaching fails.

#### Developmental Defects ←

- Endemic fluorosis leads to chalky, porous teeth.
- Systemic drug effects, especially tetracycline, cause bilateral discoloration.

#### Treatment for Developmental Defects

- External bleaching for lighter defects may be unpredictable.
- RCT followed by internal bleaching can provide better results.

#### **Hereditary and Environmental Factors**

- Hereditary defects affect both primary and permanent teeth.
- Environmental factors can result in enamel disturbances leading to defects.



## INTERNAL BLEACHING



#### **Causes of Tooth Discoloration**

- Natural and iatrogenic causes lead to discoloration.
- Natural discoloration can be due to enamel flaws or trauma.

#### Internal Bleaching and it's effciacy

- Internal bleaching is a good option for pulp necrosis discoloration.
- Successful treatment for intrapulpal hemorrhage if pulp survives.

#### Age-Related Discoloration

- Older patients face physiological changes in tooth color.
- Cumulative effects of food and beverages contribute to discoloration.

#### **Severity of Tetracycline Staining**

- First-degree shows light discoloration without banding.
- Third-degree demonstrates severe horizontal banding on crowns.

#### **Types of Defects in Tooth Formation**

- Hypoplastic defects result from protein matrix formation issues.
- Hypomineralized defects show bright white spots on enamel.

#### **Psychological and Emotional Impact**

- Patients often seek cosmetic improvements for their confidence and quality of life.
- Economic aspects play a role, as non-invasive options may be preferred for affo rdability.





#### Obturating Materials ←

- Most severe discolorations are linked to obturating materials.
- Incomplete removal leads to dark discoloration primarily from sealer remnants.

#### Literature Review on Sealers ←

- A review showed discoloration severity over 3, 6, and 9 months: Endofill > ZOE > Tubuliseal > AH 26.
- All materials can cause discoloration if not placed correctly.

#### Intracanal Medicaments and Discoloration (

- Certain medicaments like phenolic and iodoform lead to discoloration.
- Ledermix, used for its therapeutic effects, can cause severe discoloration.

#### Bleaching Materials Overview ( )

- Common agents include hydrogen peroxide, sodium perborate, and carbamide peroxide.
- Hydrogen peroxide is the most potent bleaching agent primarily used.

#### **Clinical Treatment Steps for Internal Bleaching**

- Initial radiographs are essential to check root filling quality.
- Temporary restorations should be placed prior to bleaching to manage color changes

#### **External Bleaching Protocols**

- External bleaching utilizes 10% carbamide peroxide gels.
- Strict policies exist on the concentration of bleaching agents available for consumer use.



## MIND MAP

## IATROGENIC OR INFLICTED DISCOLORATIONS



#### **Introduction to Discoloration**

- Discoloration can arise from various materials and chemicals.
- This type is generally preventable but difficult to correct with bleaching alone.



- Australian Endodontic Society's research shows that AH 26 darkens due to silver content.
- Silver-free alternatives are now available.

#### **Internal Components Causing Discoloration**

- Pulpal tissue remnants lead to gradual staining of the tooth.
- Blood components disseminated into dentinal tubules from pulp extirpation can also cause discoloration.

#### **Coronal Restorations Impacting Color**

- Both metallic and composite restorations can diminish tooth color.
- Amalgam is particularly notorious for darkening the tooth.

#### **Bleaching Techniques: Internal vs External**

- Internal bleaching (non-vital) can be performed with thermocatalytic or walking bleach techniques.
- Walking bleach is the safest and widely recommended method.

#### Prognosi

#### **Prognosis and Complications**

- External cervical resorption is a known risk of internal bleaching.
- Increased brittleness and potential chemical burns can occur due to the bleaching process.



#### Conclusion

- All forms of endodontic materials can lead to varying discoloration levels.
- Bleaching procedures can often correct discoloration, but precautions are necessary for optimal results.

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## What are the common causes of tooth discoloration?



### INTERNAL BLEACHING

#### Answer 1

Tooth discoloration can be caused by natural factors, including flaws in enamel and traumatic injury, or iatrogenic factors, such as certain dental procedures and materials that can lead to staining.





# How does pulp necrosis contribute to tooth discoloration?



#### INTERNAL BLEACHING

## Answer 2

Pulp necrosis can lead to the release of colored compounds that permeate dentinal tubules, staining the surrounding dentin. The degree of discoloration is directly related to the duration of the pulp's necrosis.





## What is intrapulpal hemorrhage, and how does it affect tooth color?



# Answer 3

Intrapulpal hemorrhage occurs due to an impact injury causing blood vessel disruption. If the pulp becomes necrotic, discoloration remains and worsens over time. If the pulp survives, the tooth may regain its original color.





# Question 4

What is calcific metamorphosis and how does it affect tooth appearance?



# Answer 4

Calcific metamorphosis involves excessive formation of tertiary dentin following an impact injury, leading to a flat crown appearance and gradual discoloration. The pulp usually remains vital, and external bleaching is attempted initially.



# Question 5

# What are the effects of age on tooth color?



# Answer 5

In older patients, tooth color changes physiologically due to extensive dentin apposition and enamel thinning. Additionally, dietary factors can contribute to cumulative discoloration.





# Question 6

# How does endemic fluorosis cause tooth discoloration?



# Answer 6

Endemic fluorosis results from excessive fluoride ingestion during tooth formation, leading to a chalky appearance that absorbs stains over time, requiring external bleaching for correction.





# **Question 7**

# What are the different severity stages of tetracycline staining?



# Answer 7

Tetracycline staining severity ranges from first degree (light discoloration without banding) to second degree (more intense without banding) and third degree (very intense with horizontal color banding).





# Question 8

# What role do obturating materials play in tooth discoloration?





# Answer 8

Obturating materials can cause significant discoloration, especially if remnants remain in the pulp chamber, with different materials exhibiting varying degrees of staining potential.





# Question 9

# What are the materials commonly used for internal bleaching?



# Answer 9

Common materials for internal bleaching include hydrogen peroxide, sodium perborate, and carbamide peroxide, with sodium perborate being preferred for internal bleaching applications.





# Question 10

# What are the potential complications of internal bleaching?



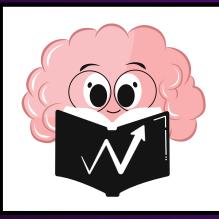
# Answer 10

Complications from internal bleaching may include external cervical resorption, coronal fractures, and chemical burns, particularly associated with high concentrations of hydrogen peroxide.



# **ENDODONTICS**

# SURGICAL ENDODONTICS



MIND MAP & CUE CARDS



BY DR. JIGYASA SHARMA

#### Causes of Root Canal Treatment Failure ←

- Associated with periapical radiolucency pre-operative.
- Root Fillings with voids or short of the apex increase failure risk.

#### Endontic Surgery Overview +

- Performed through a surgical flap for difficult cases.
- Aims to seal root canal spaces and promote tissue regeneration.

#### Indications for Peripical surgery

- Anatomical problems like blocked canals or severe curvature
- Procedural accidents such as separated instruments or perforations

#### Managing Symptomatic Cases ←

- Symptoms may persist post-treatment, necessitating PAS.
- PAS helps to identify underlying issues for persistent symptoms.

#### **Biopsy Necessities**

- Certain cases may require biopsy to rule out non-pulpal lesions.
- Vital pulps with radicular radiolucency indicate a need for biopsy.

#### **Anatomical Factors in PAS**

- Inaccessibility due to tooth location or proximity to critical structures limits sur.
- Caution is necessary for specific anatomical configurations.

#### Indiscriminate Use of Surgery ←

- Surgery is unethical when a non-surgical approach could succeed.
- Asses each case critically before opting for surgery





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MIND MAP

SURGICAL ENDODONTICS



### Introduction to Non-Surgical Endodontics

- Non-surgical root canal therapy has a high success rate (47–97%).
- Failures may lead to either nonsurgical retreatment or endodontic surgery.



- Offers better cleaning opportunity compared to surgery.
- May not be appropriate in all cases.



#### **Periapical Surgery (PAS)**

- Commonly removes root portions or seals apically.
- Indicated for anatomical issues, procedural accidents, and symptomatic cases.



- Items like posts or non-absorbable pastes may require surgical intervention
- Surgical approach often results in better outcomes



- Most fractures heal but may need intervention if necrosis is occurs
- Evaluate the apical seal if surgery is warranted



#### **Contraindications for Peripical Surgery**

• Four primary contraindications: anatomical factors, systemic complications, improper surgery application, unidentified treatment failure causes



#### **Medical or systemic Complications**

- Severe health issues or apprehension may render patients unsuitable for PAS.
- Blood disorders or uncontrolled diseases are significant risks

#### **Unidentified Causes of Treatment Failures**

- Surgery unlikely to succeed without clear identifications of failure causes
- Further evaluation needed to understand treatment failures before deciding on surgery.



Map Your Way to ADC Success!

#### Treatment Planning ←

- After diagnosis, it is vital to discuss treatment options and obtain patient consent.
- Referrals should be made to suitable dentists for specialized cases.

#### Flap Design Principles +

- A well2-designed flap facilities optimal exposure for surgical procedures.
- Factors influencing flap design include lesion accessibility, periodontal health, and coronal tooth structure.

#### Sub Marginal Triangular and Rectangular Flap 🗲 🦚

- Triangular or rectangular flaps involve a scalloped incision but also have visibility limitations compared to full mucoperiosteal flaps.
- Most effective for maxillary anterior teeth with crowns but may cause scarring

#### Osteotomy Procedure ← (\*\*)

- Assesment of root length and axis is crucial for accurate bone removal during osteotomy.
- Use of reverse air handpiece with strile cooling ensures minimal heat generation

#### **Root End Resection**

- Resection should be nearly perpendicular to the tooths long axis to minimize exposed dentinal tubules
- The root end must be examined under magnification to verify completeness of resection

#### **Closure of the Surgical site**

- Soft tissue flaps should be saturated for primary closure to promote optimal healing
- Sutures must be removed 48-96 hours post-operatively



WINSPERT MIND MAP

# CLINICAL STEPS DIN SURGICAL PROCEDUREEND ODONTICS



### Clinical and Radiographic Assesment

- A thorough inatoral and extronal assessment is essential for accurate diagnosis.
- Long cone parallel periapical radiographs provide reliable diagnostic information, with additional angled radiographs for more insights



#### **Clinical Management**

- Using CHX mouth rinse pre-procedurally can help reduce plaque formation
- Local anesthesia is preferred for pain management and enhances hemotasis at the surgical site.



#### Semilunar/Submarginal Curved Flap Design

- The semilunar flap consists of a curved incision in the gingiva, but lacks reliability.
- Limited visibility and increased scarring are disadvantages of the flap type.



#### **Full Mucoperiosteal Flap**

- This flap allows maximal access with incisions at the gingival crest and full elevation of surrounding tissues.
- It minimizes bleeding risks and avoids incising over bony defects.



#### **Periradicular Curettage**

- Essential to remove soft tissue in the periradicular area for visibility but leave reparative tissues intact if needed
- Pathological samples should be submitted for histological evaluation.



#### **Root end Cavity Preperation and Filling**

- Preparation is 3mm deep in the roots longs axis, often best done with ultrasonic tips.
- Hemostatic agents are crucial, and biocompatible materials like MTA should be used for filling.



#### **Post-Surgical Considerations**

- While complications are rare, expect post-operative pain, swelling, and potentia.
- Pain and swelling can be managed with appropriate medication and ice applications.



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#### Hemisection ← 🖨

- Definition: Surgical division of a multirooted tooth
- Techniques: Involves bucco-lingual cuts for mandibular molars and mesiodistal

#### Indications for Procedures ←

- Criteria: Situations justifying the use of root amputation, hemisection, and bicupidization.
- Examples: Severe bone loss, peridontal issues, and maintaining tooth structure.

#### Recovery Process ←

- Healing: Overview of recovery expectations post surgery
- Timeline: Estimated duration for healing and restoration processes

#### **Post-Operative Care** ←

- Hygiene: Importance of maintaining oral hygiene after procedures.
- Diet: Recommended dietary changes during recovery.

#### Conclusion

- Summary: Recap of the importance and implications of these dental procedures
- Future Directions:Insights into advancements in dental surgery techniques



DENTAL PROCEDURES:

ROOT AMPUTATION,

HEMISECTION, &

BISCUPIDIZATION



#### **Root Amputation**

- Definition: Removal of one or more roots from a multirooted tooth
- Procedure: Conducted at the rootcrown junction, commonly on maxillary molar.

#### Bicupidization

- Definition: Surgical division of a mandibular molar while preserving both halve
- Retention: Allows both parts to be restored to function similar to a bicuspid

#### **Contraindications for Procedures**

- Limitations: Conditions where the procedures should not be performed
- Cases: Unsuitable scenarios based on tooth health or structure

#### **Potential Complications**

- Risks: Possible negative outcomes following each of the procedures.
- Management: stratagies for handling complications, if they arise

#### **Long term Outcomes**

- Prognosis:Expected longevity and functionality of treated teeth.
- Success Rates:Statistical data supporting procedure efficacy





# Question 1

# What is the success rate of non-surgical root canal therapy (RCT)?



# Answer 1

The success rate of orthograde endodontic treatment (RCT) ranges from 47% to 97%.



# Question 2

# What are the reasons for root canal treatment failure?



# Answer 2

Failures are likely associated with the pre-operative presence of periapical radiolucency, root filling with voids, root filling more than 2mm short of the radiographic apex, and unsatisfactory coronal restoration.



# **Question 3**

# What is the purpose of endodontic surgery?



## Answer 3

The purposes include sealing all portals of exits to the root canal system, eliminating bacteria and their byproducts from contaminating periradicular tissues, and providing an environment for the regeneration of periradicular tissues.



# Question 4

# What are the main indications for periapical surgery (PAS)?



# Answer 4

The main indications are anatomic problems, procedural accidents, irretrievable materials in the root canal, symptomatic cases, horizontal apical fractures, as well as biopsy and corrective surgery.



# Question 5

# What are the contraindications for periapical surgery (PAS)?



# Answer 5

The four major contraindications are anatomical factors, medical or systemic complications, indiscriminate use of surgery, and an unidentified cause of treatment failure.



# Question 6

# What is a major consideration before performing endodontic surgery?



# Answer 6

A thorough clinical and radiographic assessment should be performed, including the use of long cone parallel periapical radiographs for accurate diagnosis.



# **Question 7**

# What is the importance of flap design in endodontic surgery?



# Answer 7

Flap design is crucial for adequate exposure of the surgical site and depends on factors such as the size of the periradicular lesion and adjacent anatomical structures.



# Question 8

# What role do obturating materials play in tooth discoloration?



# Answer 8

The root end preparation should be 3 mm deep in the long axis of the tooth.



# Question 9

# How can post-operative pain and swelling be managed after endodontic surgery?



# Answer 9

Pain can be managed with analgesics, and postoperative swelling can be reduced by applying an ice pack for the first 4-6 hours after surgery.



# Question 10

# What distinguishes root amputation from hemisection in surgical procedures?



# Answer 10

Root amputation involves the removal of one or more roots of a multirooted tooth at the junction of the root and crown, while hemisection is the surgical division of a multirooted tooth through the bifurcation.