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# Caries management: When, why, and how

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**ABSTRACT**

Restorative dentistry has increasingly become conservative in its treatment of incipient carious lesions of enamel. Practice has shifted from a "watch and wait" attitude to preservation of native tooth structure as this improves the longevity of the tooth. Identifying breakdown of tooth structure at its earliest stages of demineralization allows for more conservative intervention. We will discuss methods to treat white-spot (hypocalcified) lesions, reversing demineralization and preventing involvement of the underlying dentin. Additionally, methods will be discussed for conservative tooth preparation and better methods for selective tooth removal of infected dentin.

**EDUCATIONAL OBJECTIVES**

At the conclusion of this educational activity, participants will be able to:

1. Describe how to treat white-spot lesions
2. Identify what treatments can be employed for conservative caries treatment of incipient lesions
3. Describe treatments that may be employed for root exposure

Restorative dentistry is predominantly centered on management of caries of the remaining dentition. Technology has advanced beyond the explorer to allow identification of incipient lesions on the enamel, thus permitting earlier intervention and subsequent preservation of tooth structure. Longevity of the dentition is correlated with the amount of native tooth structure remaining. The greater the volume of dentin and enamel that is preserved, the greater the longevity of the tooth.

## Early intervention

When changes are noted to the tooth surface before cavitation has resulted, early intervention is indicated. Cavitation is defined as microstructural damage to the enamel, which as it progresses deeper into the enamel exposes the underlying dentin to oral bacteria, leading to subsequent breakdown via acid attack, leading to caries. During clinical examination, when an explorer is used to evaluate pits and fissures and smooth surfaces, light force should be applied with the tip, as heavier forces may increase the potential for cavitating the area.[1-4] Initial surface changes will appear as color changes to the enamel in comparison to the surrounding tooth structure, indicating the initiation of demineralization of

the enamel, which is termed an incipient lesion. Once this incipient lesion progresses to reach the dentin below, more direct treatment is indicated. In cases of exposed dentin, such as a root surface that has lost its thin coating of cementum, early intervention may be applied when cavitation is not present to either prevent future breakdown or for treatment of tooth sensitivity.

## Remineralization

When white spots are noted on the smooth surfaces of the teeth or at the pits and fissures without surface breakdown, this is a sign of early decalcification of the enamel surface. If allowed to progress, the lesion will require more extensive restorative treatment. When identified and preventive treatment is initiated, these superficial areas can undergo remineralization and eliminate the need for more extensive treatment.

Isolated areas of initial demineralization may be indicative of weaker areas of the enamel, and remineralization therapy may be effective when sensitivity is not present on that tooth. Sensitivity typically indicates deeper penetration of the demineralization process extending to the dentinoenamel junction (DEJ). Thus, when sensitivity is present, something more extensive may be required to arrest the initial breakdown. This may involve sealing the surface with an adhesive resin to reinforce the enamel and prevent further demineralization, or a conservative preparation to remove the affected enamel and dentin.

## Topical remineralization home-care therapy

When minor enamel demineralization is noted (white-spot lesions or areas associated with the pits and fissures), at-home remineralization may be used to prevent caries advancement. This also has application to root exposure resulting from gingival recession. Fluoride rinses or daily topical application may be sufficient in some patients to treat these minor initial chalky areas, but they are dependent on patient home care to be effective.

Remineralization products that are calcium phosphate based have shown promising results for noninvasive management of these areas before early carious lesions can occur.[5,6] Additionally, application of products containing casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) has been reported to lead to suppression of demineralization with enhancement of remineralization of the tooth surface.[7] Further, it has been demonstrated that the combined application of CPP-ACP with fluoride provides a synergistic effect on enamel remineralization.[8,9] Tooth Mousse Plus (MI Paste Plus; GC America, Alsip, Chicago) combines CPP-ACP and 900 ppm fluoride (CPP-ACPF) to provide a more therapeutic effect than Tooth Mousse (MI Paste), which contains CPP-ACP alone.[10] Alternatively, a remineralizing water-based cream containing hydroxyapatite, fluoride, and xylitol (Remin Pro, Voco Dental, Indian Land, SC) is available.[11,12] The manufacturer claims that the eroded enamel is filled by the hydroxyapatite, with the fluoride sealing any exposed dentinal tubules, and the xylitol acts as an antibacterial agent. This product is suitable for prevention of enamel demineralization, promoting remineralization of enamel subsurface lesions and management of dentinal hypersensitivity.[13,14]

There is growing appreciation of silver diamine fluoride (SDF) usage to prevent, slow, or stop dental caries, which is an off-label use with the FDA currently giving it clearance only as a desensitizing agent.[15] SDF has been shown to be effective at inhibiting further tooth structure demineralization.[16,17] One negative to the use of SDF is black discoloration of the tooth structure, which can be an esthetic issue when used in the anterior region.[18,19] Application is not particularly technique sensitive. There are several protocols, but generally, following removal of plaque from the tooth surface, the liquid SDF is applied to the affected tooth structure with a microbrush for one minute, and then gently air dried and allowed to set for two to three minutes, with or without light cure (figure 1).[20]

**FIGURE 1:** Dark staining following application of SDF to a demineralized lesion on the tooth

## Resin infiltration of enamel surface white spots

When white-spot lesions (WSLs) are noted, and penetration has not reached the DEJ and there is no surface cavitation, reinforcement of the decalcified enamel is possible without preparation of the tooth to accommodate a restoration.[21] Resin infiltration is a minimally invasive restorative treatment for white-spot enamel lesions on the facial/buccal surfaces (figure 2) or incipient interproximal enamel lesions (figure 3). These types of lesions are associated with subsurface enamel porosities caused by a cyclical imbalance between demineralization and remineralization of the enamel. This results from poor hygiene and diets high in fermentable carbohydrates. These lesions are associated with bacteria-derived acids in plaque.[22] Over time, remineralization of the outer surface of the tooth can eventually arrest the lesion, though there may be decreased access of calcium and other ions to deeper portions of the enamel. During resin infiltration, the acid-resistant resin fills in the molecular spots in the enamel

**FIGURE 2:** Resin infiltration with ICON (DMG) to treat white spots on the facial surfaces of the anterior teeth


**FIGURE 3:** Resin infiltration being used to treat incipient lesion on the surface of the interproximal enamel

where calcium was removed due to acid attack, making the area more resistant to future demineralization. The benefits of resin infiltration in treating these WSLs are that it is not invasive, it conserves tooth structure, and it may eliminate tooth sensitivity without the need to surgically remove the tooth structure in preparation for a restoration.

WSLs and enamel demineralization are subsurface, representing the first stage of caries formation. The etiology of white spots relates to pathogenic bacteria infiltrating the enamel surface and producing organic acids capable of dissolving the calcium and phosphate ions of the dental structure, thus causing caries.[23] Those microporosities within the hypocalcified enamel are filled with either a watery medium or air. Ambient light that shines on the teeth is deflected and scattered, making the initial carious lesions appear as a clinically visible opacity, especially when desiccated, leading to their white appearance compared to the adjacent enamel.[24]

The aim of resin infiltration treatment is to prevent further progression of early carious lesions by occluding those pores in the hypocalcified enamel, which were acting as a cariogenic acid pathway. A very low viscosity resin, referred to as "infiltrant," acts by occluding those pores by capillary forces, thus eliminating the microvoids.[25] When the pores are filled with the resin infiltrant, the infiltrated WSLs become similar in appearance to the surrounding sound enamel.[26] If the pores of the lesion can be completely occluded with the infiltrant, the progression of WSLs may be prevented, and esthetic issues may be resolved.[27] The infiltration of the low-viscosity light-curing resin into the subsurface lesion is an intermediary treatment between preventive and restorative treatment for the arrest of carious lesions and esthetic improvement.[28,29] The infiltration of the resin into porous lesion structures could mechanically strengthen the lesion and prevent or delay eventual cavitation. Additionally, it blocks the further introduction of any acid into the porous system. This method can be used on patients with a known fluoride sensitivity.[30,31] ICON (DMG, Ridgefield Park, NJ) is a resin infiltration product used chairside to force resin into the hypocalcified enamel, thus reinforcing it. This resin infiltration is considered a long-term treatment solution, with research showing stability for up to six years.[32] Resin infiltration is limited to hypocalcification of the enamel but may be used in clinical situations where it has reached the DEJ as long as the enamel surface is intact. Esthetically, WSLs, when infiltrated with resin, demonstrate a better blend with adjacent unaffected enamel, but the WSLs may not completely disappear visually in some cases where the tooth shade of the unaffected tooth is darker.[33]

## Caries treatment

Restorative treatment has moved increasingly to conservation of tooth structure, as it has been shown that maintaining native tooth structure increases the long-term survival of the tooth. No artificial material has been developed to date that restores tooth structure to pretreatment strength. As teeth flex under occlusal forces (mastication), the stresses are concentrated at the cervical area, so preservation of this area is critical to long-term tooth survival. Additionally, maintenance of coronal tooth structure is important to long-term function, and preserving this should be the goal of treatment. This starts with identification of caries as early as possible and treatment of those lesions to maintain as much unaffected tooth structure as possible.

## Pit and fissure treatment

Pit and fissure depth and width vary from patient to patient in healthy, noncarious teeth. Shallow pits and fissures are easier for the patient to maintain through home care, preventing bacteria from initiating incipient lesions as readily. Patients with deep pits and

fissures are more prone to incipient lesions since toothbrush bristles are often wider than the pits and fissures, hampering home care and allowing initiation of caries. In primary teeth, 44% of early carious lesions are found in the pits and fissures of molars.[34] Within the adult population, initial caries are also found predominantly in the pits and fissures of posterior teeth; however, this is less frequently observed in adults compared to children due to improved home care and diets lower in carbohydrates, if the patient makes it to adulthood with posterior teeth unaffected or restored.[35]

Sealants have been shown to greatly improve caries prevention in vulnerable pits and fissures.[36-38] These are routinely recommended in children, but adults may benefit from them as well. Stained pits and fissures may indicate deep anatomy with a potential for caries that is not easily preventable with standard home care. Depending on the anatomy of the pits and fissures, surface treatment may vary from acid etching the enamel, microetching with an air abrasion unit, or treatment with an Er:YAG laser to improve bondability to the enamel. These options will be operator dependent related to what is available in the practice and clinical judgment. Traditional acid etching may be challenging in children, so use of air abrasion or laser etching may make patient management easier in the pediatric patient. Although air abrasion cannot confine the powder to only the surface of the tooth being treated, it has a neutral taste and may be less objectionable to the patient. The benefits of the Er:YAG laser are that it eliminates issues with etch gel taste and application time and powder disbursement orally, and it allows less time between initiation of sealant treatment and placement of the resin on the tooth. Deeper pits and fissures with definitive caries require minimal preparation to access and remove caries prior to restoring these areas with an adhesive restorative material such as a flowable resin.

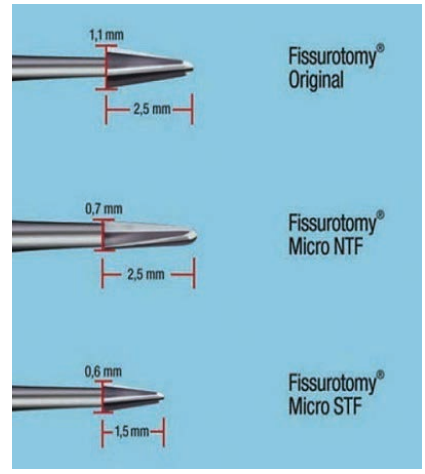


**FIGURE 4:** Fissurotomy burs in three sizes for conservative preparation of pits and fissures to treat incipient lesions

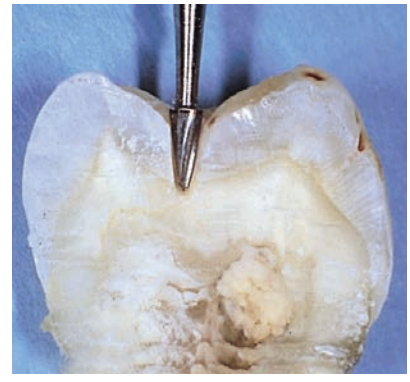

**FIGURE 5:** Due to its microdimensions, the fissurotomy bur allows preparation of the pits and fissures without sacrificing adjacent tooth structure that would occur with traditional burs.

## Fissurotomy burs

Fissurotomy burs (Smartbur, SS White, Lakewood, NJ) are high-speed, friction-fit carbide burs with a very narrow width and a pointed shape designed to conservatively access pits and fissures while conserving adjacent tooth structure (figure 4). These allow access to the areas affected without sacrificing adjacent tooth structure that occurs with a traditional carbide bur (figure 5). When a pit or fissure is diagnosed with caries beyond remineralization, either with an explorer or caries detection device (figure 6, top), the fissurotomy bur is used to prepare only the affected area (figure 6, middle) and preserve healthy adjacent tooth structure for a conservative restoration. A flowable resin can then be placed versus a traditional sealant resin, as the flowable resins are filled and will offer better wear resistance and, hence, longer survival potential to the restoration (figure 6, bottom). Fissurotomy burs are also well suited for creation of micromechanical retention when preparing cervical areas of teeth to receive composite restorations (figure 7).

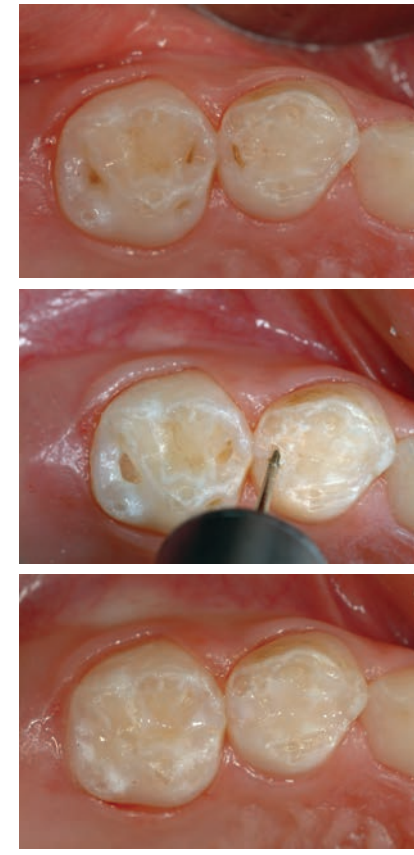

**FIGURE 6:** Incipient caries identified in the stained pits of the deciduous molars (left); conservative preparation of pits and fissures is achievable with the fissurotomy bur (middle); and a conservative bonded-resin restoration placed and finished (right)

## Smartburs

Differentiation between infected and affected dentin and selective removal can be challenging with carbide or

**FIGURE 7:** The fissurotomy bur can be utilized to create micromechanical retention in the preparation when treating cervical caries to resist the potential of restoration pop-out during function.

**FIGURE 8:** Polymer Smartburs in various sizes for caries removal on dentin

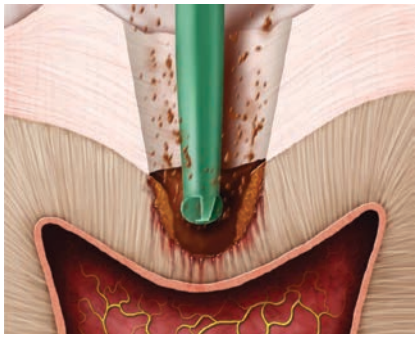

**FIGURE 9:** The polymer Smartbur has no cutting ability on enamel and is selective in cutting for affected dentin, providing a safety factor when selectively removing caries, thus lessening the potential for pulpal exposure compared to the use of a stainless steel or carbide bur.

diamond burs as it is a subjective clinical decision reliant on tactile feel. The key is a removal instrument that is harder than the infected dentin but softer than affected dentin, allowing for selective removal of infected dentin while preserving affected dentin. With this goal in mind, a polymer bur was developed (Smartbur, SS White, Lakewood, NJ) that is used with a slow-speed handpiece (figure 8).[39] Following removal of carious enamel, the majority of infected dentin is removed with traditional burs or diamonds, leaving some caries at the base of the preparation. These polymer burs limit potential for inadvertent pulpal exposure during deep caries excavation (figure 9). The Smartbur is then used on the deeper areas to remove the infected dentin while preserving as much tooth structure as possible (figure 10). These polymer burs limit potential for inadvertent pulpal exposure during deep caries excavation compared to carbide or diamond burs (figure 9). Polymer burs are single-use and wear quickly when contacting sound dentin. They have no effect on enamel and are designed to be used only on dentin.

## Ozone treatment

Ozone has been shown to cause the inactivation of bacteria, viruses, fungi, yeast, and protozoa.[40] This occurs by disruption of the integrity of the bacterial cell wall by oxidation of their phospholipids and lipoproteins. Ozone, at low concentrations of 0.1 ppm, is sufficient to inactivate bacterial cells, including their spores.[41] In fungi, it inhibits cell growth at certain stages, with budding cells being the most sensitive.[42] With regard to viruses, ozone damages the viral capsid and upsets its reproductive cycle by disrupting virus-to-cell contact with peroxidation.[43] Ozone oxidizes pyruvic acid produced by cariogenic bacteria into acetate and carbon dioxide, removing the bacteria's effects on tooth structure.[44] Reversal and arrest of shallow, non-cavitated carious lesions has been reported following the use of ozone.[45,46] Ozone is most effective in cases of shallow lesions as its penetration is about 1 mm deep at the maximum. When used in deeper lesions, excavation of the majority of caries is necessary, leaving about 1 mm of affected dentin before ozone application to the tooth and then followed by restorative placement. Recent reports have indicated use of ozone in deep caries preparations resulted in fewer occurrences of the need for endodontic intervention than when it was not utilized.[47,48]

Ozonated water may be used to remineralize incipient carious lesions and has been demonstrated to enhance the remineralizing potential of nano-hydroxyapatite, thus preventing the tooth from entering into the repetitive restorative cycle.[49] This could have potential clinical implications in deep carious lesions where removal of all of the infected dentin would necessitate endodontic treatment. Application of ozone gas to the prepared tooth appears as an effective and biocompatible cavity disinfectant

**FIGURE 10:** Cervical caries noted requiring restorations (left). Following access to carious dentin, the Smartbur is used to selectively remove affected dentin (middle) while preserving unaffected dentin to follow conservative tooth preparation goals (right).

in treatment of deep carious lesions by incomplete caries removal technique.[50] Treating the area prior to placement of the restoration may decrease the bacterial load present in the infected carious dentin, thus delaying or preventing caries-related bacterial involvement of the pulpal tissue.[51]

## Root exposure

Gingival recession may frequently lead to breakdown of the exposed root surface by mechanical or chemical means. This is related to the patient's oral habits and diet. Many patients with root exposure demonstrate no structural changes of the dentin and are stable over long periods of time. Other patients may present with root sensitivity with varying amounts of dentin exposure even when no loss of dentin is noted. Patients with structural breakdown that has initiated but is beyond remineralization methods will require conservative treatment to arrest further breakdown and reduce any sensitivity associated with root exposure. Conservative treatment of these exposed root areas aids in preservation of tooth structure, is atraumatic, and frequently can be performed without use of local anesthetic with minimal preparation.[52,53] Hard tissue lasers are well-suited for these clinical situations as they can be used without local anesthetic with no sensitivity during treatment and provide a surface that is bondable and retentive. Additionally, it has been reported that laser preparation on class V restorations provides superior marginal integrity compared to conventional bur preparation.[54]

The increase in the aging population and preservation of teeth into later decades (70s and older) have shown a growing incidence of root exposure with subsequent dentin breakdown.[55,56] This becomes increasingly problematic in elderly patients with declining health and/or cognitive changes such as dementia that limit their ability to maintain oral hygiene. Material selection for treatment of these root areas is either a glass ionomer (conventional or resin-modified), silver diamine fluoride, or resin-based material (adhesive composite). Root surfaces are easily contaminated with saliva during treatment, causing retention issues with bonded composites; thus, glass ionomer or SDF may yield more predictable results. An additional benefit is fluoride release over time, which aids in prevention of recurrent caries.[57]

Silver diamine fluoride demonstrates a high caries arrest rate (96%) and prevention (70%) compared to other materials.[58,59] However, as mentioned earlier, tooth discoloration is a drawback if SDF is used as the sole material, and this is frequently objectionable to the patient. This can be overcome by placement of a glass ionomer material over the SDF, which provides good adhesion to the SDF and is opaque enough to block out any potential visible dark staining.[60]

## Discussion

Long-term maintenance of the dentition correlates with preservation of tooth structure and should be the goal of restorative treatment. Identification of demineralization of the enamel is the first sign of breakdown of tooth structure, and early detection aids in preservation of vital tooth structure and improves the long-term survival of the dentition. When confined to the enamel with no dentin involvement, the practitioner can use techniques to remineralize the affected enamel. Patients presenting with multiple chalky areas can benefit from at-home care with products that improve enamel mineralization. Diet modification should be considered to decrease amount and frequency of foods and beverages that favor demineralization and caries potential, specifically food and drink containing fermentable carbohydrates and presenting strong acid challenges to the oral environment. Isolated chalky areas may be best treated by resin infiltration to strengthen the enamel and prevent further breakdown. This may also be applied interproximally when small incipient lesions that have not reached the dentinoenamel junction are noted radiographically.

When the area of structural breakdown has reached the underlying dentin, conservative preparation allows access to those areas while preserving surrounding unaffected dentin and enamel. Areas of caries that are more extensive can be clinically challenging when using metal burs (stainless steel and carbide) to excavate the deep caries, since tactile feel may not be sufficient to determine infected versus affected dentin and can lead to an unintended dentin removal or possible pulpal exposure. Polymer burs in a slow-speed handpiece permit selective dentin removal and decrease potential for pulpal exposure. Caries depth will dictate removal versus treatment of small areas of residual affected dentin. Ozone may allow isolated small areas to remain in the tooth preparation while inactivating any bacteria contained therein, preventing further dentin breakdown and possibly delaying or eliminating the need for endodontic treatment in vital teeth.

Glass ionomer and SDF restorative materials have been helpful in treatment of root exposure when minimal caries are noted, or in elderly patients who may see higher caries rates on exposed root areas. These materials have demonstrated good adhesion in areas where it can be challenging to obtain a dry field for optimal placement of traditional adhesive resin restorations. Additionally, their fluoride release over time may decrease caries recurrence in susceptible patients.

## Conclusion

Identification of tooth structure breakdown and treatment at its earliest stages allows the best opportunity to

preserve critical enamel and dentin. Long-term tooth survival has been correlated to preservation of native tooth structure, and no restorative material currently in use can replicate sound enamel and dentin.

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1. Early changes in the tooth structure can be identified as:
   - A. Color alteration to the enamel compared to the surrounding tooth structure
   - B. Chalky spots on the enamel
   - C. Darker areas on exposed root dentin
   - D. All of the above

2. Cavitation is defined as:
   - A. Caries that involves the dentin
   - B. Microstructural damage to the enamel, exposing the underlying dentin
   - C. Macrostructural damage to the enamel, exposing the underlying dentin
   - D. Chalky areas on the enamel

3. What causes tooth structure cavitation?
   - A. Explorer tip contact with mineralized enamel at the pit
   - B. Abrasion of the enamel with a coarse toothbrush
   - C. Tooth preparation
   - D. Explorer tip contact with demineralized enamel at the pit

4. White spots without surface breakdown may best be treated with:
   - A. Minimally invasive restorations
   - B. Laser enamel fusion
   - C. Remineralization
   - D. Ultrasonic cavitation

5. Initial demineralization may be indicative of:
   - A. Weaker areas of the enamel
   - B. Low carbohydrate diet
   - C. Weaker areas of underlying dentin
   - D. Systemic issues such as diabetes

6. Minor demineralization of the enamel can be identified as:
   - A. Enamel crazing
   - B. Enamel cupping
   - C. White spots
   - D. Dark spots

7. A chalky area present with sensitivity typically indicates:
   - A. Sensitivity is typically not correlated with the area
   - B. Occlusal parafunction as a component
   - C. Deeper penetration of demineralization extending to the DEJ
   - D. Shallow penetration of demineralization approaching the DEJ

8. WSLs are not typically seen in/on:
   - A. Fissures
   - B. Pits
   - C. Flat tooth surfaces
   - D. Cusp tips

9. Home-care remineralization products may contain:
   - A. Casein phosphopeptide-amorphous calcium phosphate
   - B. Casein phosphopeptide-amorphous calcium phosphate with fluoride
   - C. Water-based cream containing hydroxyapatite, fluoride, and xylitol
   - D. All of the above

10. Enamel porosities caused by a cyclical imbalance between demineralization and remineralization of the enamel describes:
   - A. White-spot lesions
   - B. Hypercalcified enamel
   - C. Incipient lesions
   - D. Cavitated lesions

11. White-spot lesions that do not penetrate to the DEJ may be treated conservatively with:
   - A. Microabrasion
   - B. Fissurotomy burs
   - C. Resin infiltration
   - D. Laser preparation

12. WSLs and enamel demineralization represent:
   - A. First stage of caries
   - B. Secondary caries
   - C. Advanced incipient lesions
   - D. Esthetic issues only

13. Remineralization of the enamel surface of the tooth over time decreases the access of calcium and other ions to deeper portions of the enamel, eventually:
   - A. Causing cavitation
   - B. Accelerating the lesion
   - C. Arresting the lesion
   - D. Causing tooth sensitivity

14. White spot etiology relates to:
   - A. Organic acids produced by bacteria within the demineralized enamel
   - B. Infiltration of pathogenic bacteria through the surface of the enamel
   - C. Dissolution of calcium and phosphate ions of the dental structure
   - D. All of the above

15. White spots:
   - A. Result from hypercalcified enamel reflecting light
   - B. Result when microporosities within the hypocalcified enamel are filled with either a watery medium or air
   - C. Are initial lesions that appear to fluoresce under ambient light
   - D. Are caused by ambient light that shines on the teeth being absorbed

16. Restorative treatment has moved increasingly toward:
   - A. Conservation of tooth structure
   - B. Early identification
   - C. Early intervention
   - D. All of the above

17. When using resin infiltration, a very low viscosity resin:
- A. Is applied to the enamel surface and allowed to self-cure
- B. Is applied daily as part of routine home care
- C. Acts by refracting light on the enamel surface to optically eliminate the white spot
- D. Acts by occluding porosity by capillary forces

18. When infiltrated with resin, the white spot will:
- A. Completely disappear visually
- B. Better blend with adjacent normal enamel
- C. Become more hypersensitive
- D. Work best with hypercalcified enamel

19. Resin infiltration is:
- A. An intermediary treatment between preventive and restorative therapy
- B. An alternative to traditional restorations
- C. Used with traditional restorations
- D. Used as an aid to identify the lesion before preparation

20. Under functional loading, where is stress concentrated on the tooth?
- A. Cusps
- B. Cervical
- C. Buccal/lingual
- D. Interproximals

21. Which part of the tooth is the most critical to preserve for tooth longevity?
- A. Cervical
- B. Cusps
- C. Buccal/lingual
- D. Interproximals

22. Pit and fissure depth and width:
- A. Are uniform from patient to patient in noncarious teeth
- B. Are normally wider than deeper
- C. Are uniform when incipient lesions are present
- D. Vary from patient to patient in healthy, noncarious involved teeth

23. What percent of caries originates in the pits and fissures of primary teeth?
- A. 24
- B. 34
- C. 44
- D. 54

24. Fewer caries are seen in adults than in children because of:
- A. Pits and fissures having already been restored
- B. Improved home care and diets lower in carbohydrates
- C. Adults having shallower pits and fissures
- D. Adults having more frequent dental visits

25. Which population has a greater incidence of root caries?
- A. Children
- B. Adolescents
- C. Adults
- D. Elderly

26. Smartburs are fabricated from:
- A. Zirconia
- B. Polymer
- C. Stainless steel
- D. Carbide steel

27. Fissurotomy burs allow:
- A. Routine use without anesthetic
- B. Creation of wider, shallower preparations
- C. Use in slow-speed handpieces for more precise preparations
- D. Conservation of surrounding tooth structure when preparing the tooth

28. Ozone has been shown to cause the inactivation of:
- A. Bacteria
- B. Viruses
- C. Fungi and yeast
- D. All of the above

29. Ozonated water may be used to:
- A. Improve bonding adhesion
- B. Decrease gingival bleeding
- C. Remineralize incipient carious lesions
- D. Decrease enamel hypersensitivity

30. Use of SDF may result in:
- A. Silver toxicity in many patients
- B. Potential autoimmune reaction is some patients
- C. Pulpal hypersensitivity
- D. Dark discoloration of the tooth

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# Caries management: When, why, and how

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## EDUCATIONAL OBJECTIVES

1. Describe how to treat white-spot lesions
2. Identify what treatments can be employed for conservative caries treatment of incipient lesions
3. Describe treatments that may be employed for root exposure

## COURSE EVALUATION

1. Were the individual course objectives met?
   Objective #1: Yes No Objective #2: Yes No Objective #3: Yes No

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| | | | | | | |
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| 2. To what extent were the course objectives accomplished overall? | 5 | 4 | 3 | 2 | 1 | 0 |
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| 4. How would you rate the objectives and educational methods? | 5 | 4 | 3 | 2 | 1 | 0 |
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| 6. Please rate the author's effectiveness. | 5 | 4 | 3 | 2 | 1 | 0 |
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