Dental Hygiene Therapies and Practice

DESENSITIZATION

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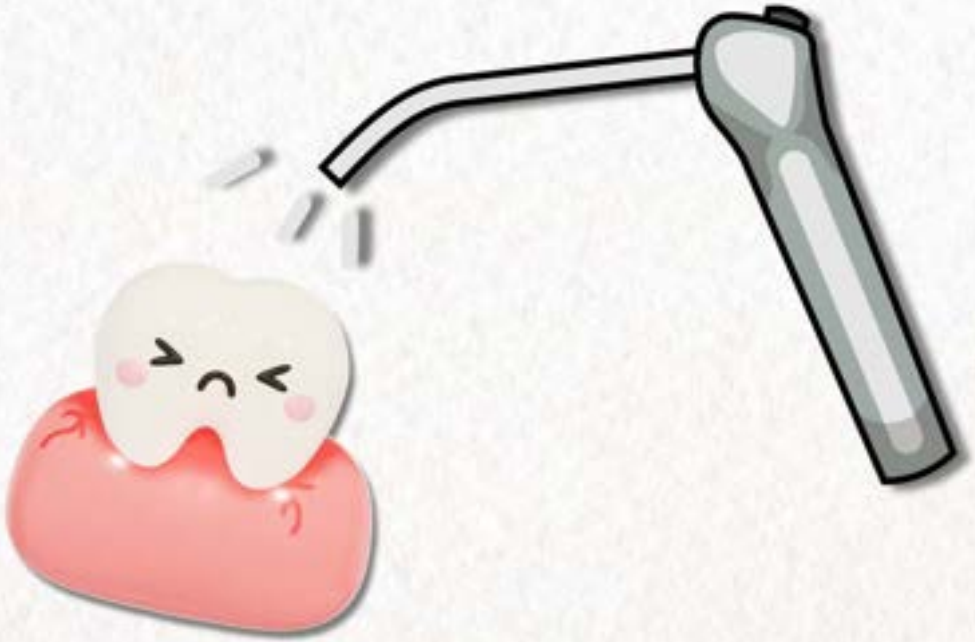
INTRODUCTION

Thinking about your clinic experiences, has anyone encountered a patient who experiences tooth sensativity?

Does anyone experience tooth sensitivity themselves?

USING AIR



Reflect on your first semester when you learned the importance of asking patients whether they experience sensitivity to air before using the air syringe.

LEARNING OBJECTIVES

1. Define dentinal hypersensitivity.
2. Explain the potential causes of dentinal hypersensitivity.
3. Determine other potential causes of sensitivity through differential diagnosis.
4. Distinguish treatment interventions and in-office desensitization procedures.
5. Demonstrate a willingness to educate patients about desensitization treatment options to help reduce discomfort.

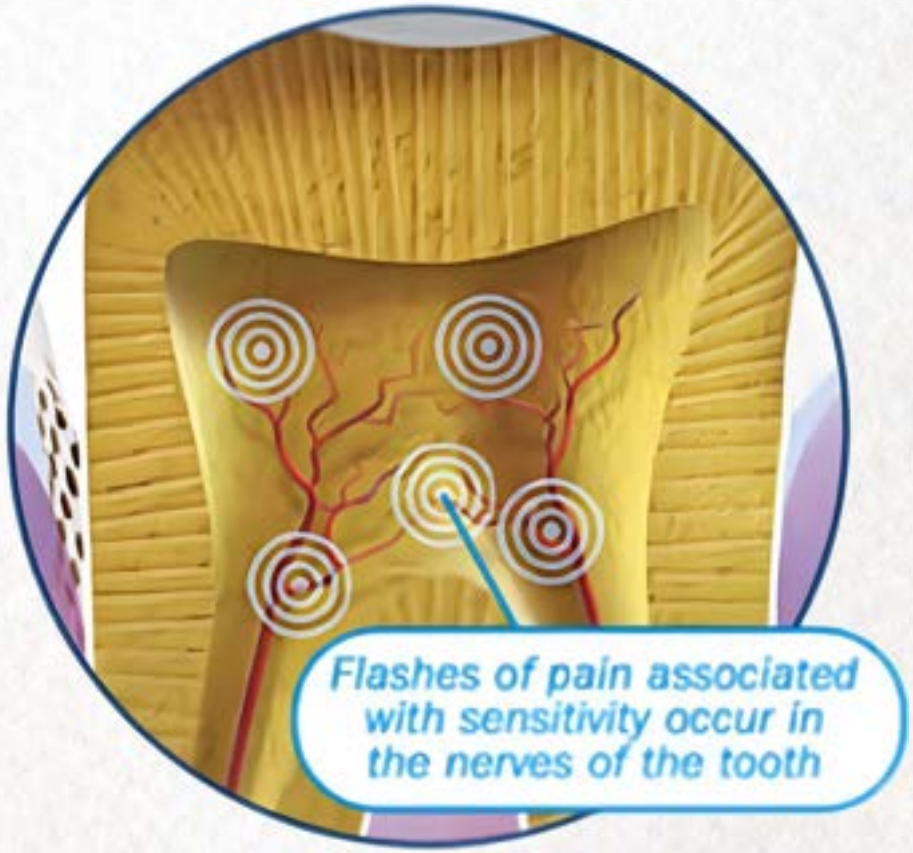
What is Dentinal Hypersensitivity?

Short, sharp, painful reaction occurring when areas of exposed dentin are stimulated.

Pain elicited by a stimulus and alleviated upon its removal

Pain arises from exposed dentin structures

Absence of other dental conditions



PREVALENCE

COMMON ISSUE IN CLINICAL PRACTICE

PREVALENCE REPORTS RANGE FROM 4-74%

- Range may be related to methods of diagnosis and population differences
- Higher among periodontal patients
- Higher among woman

PATIENTS MOST AFFECTED IN THE 20-50 YEAR RANGE

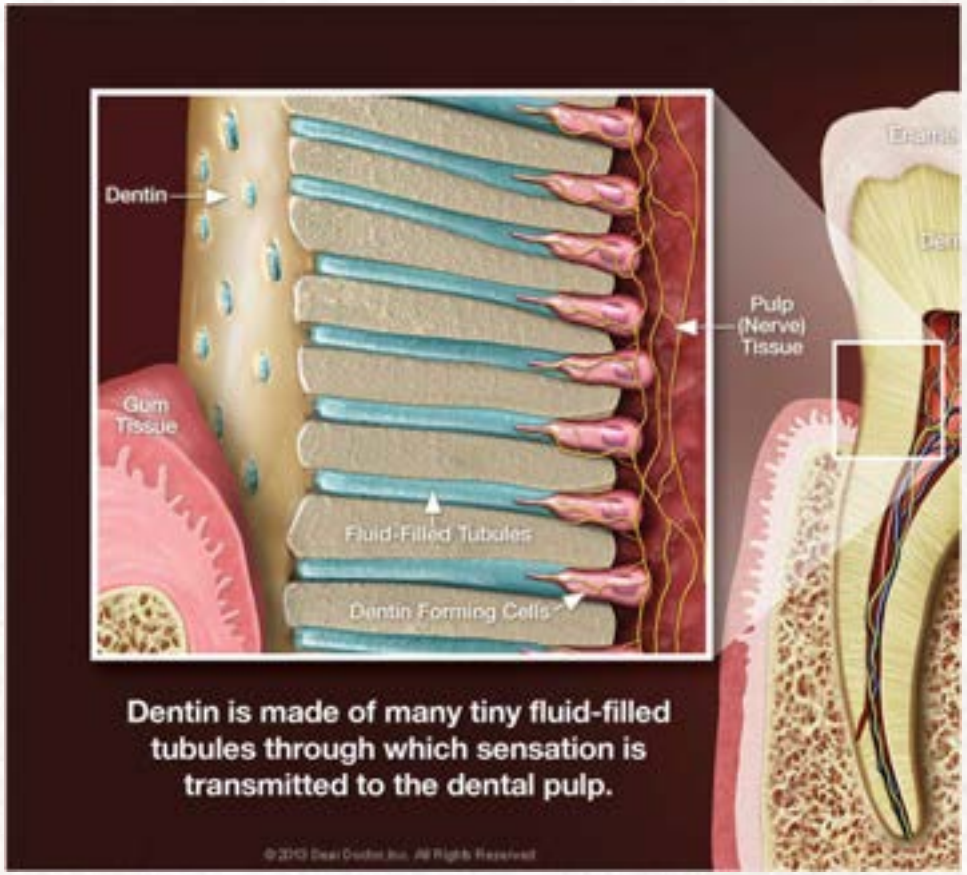
- Peak between 30-40 years

CANINES AND PREMOLARS MOST AFFECTED

- Buccal surface, cervial area most affected

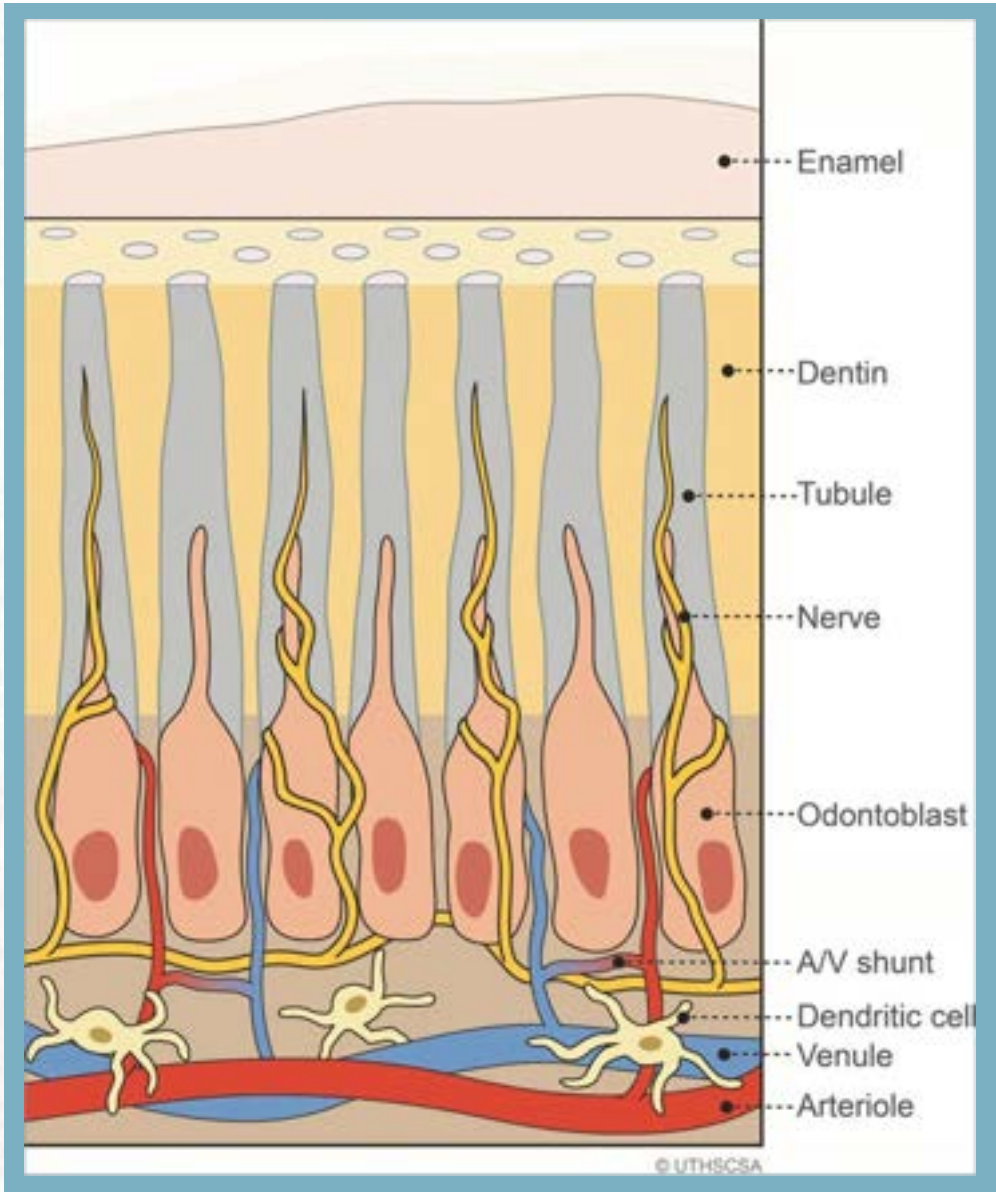
Anatomy Review: DENTIN

- Covered by enamel on crown and cementum on root
- Composed of narrow, fluid tubules
  - Branch from pulp to dentinoenamel or dentinocementum junction
- Ends closet to pulp are innervated with nerve fiber endings from pulp chamber
- Sensative areas are composed of wider tibercle openings
  - Lumen



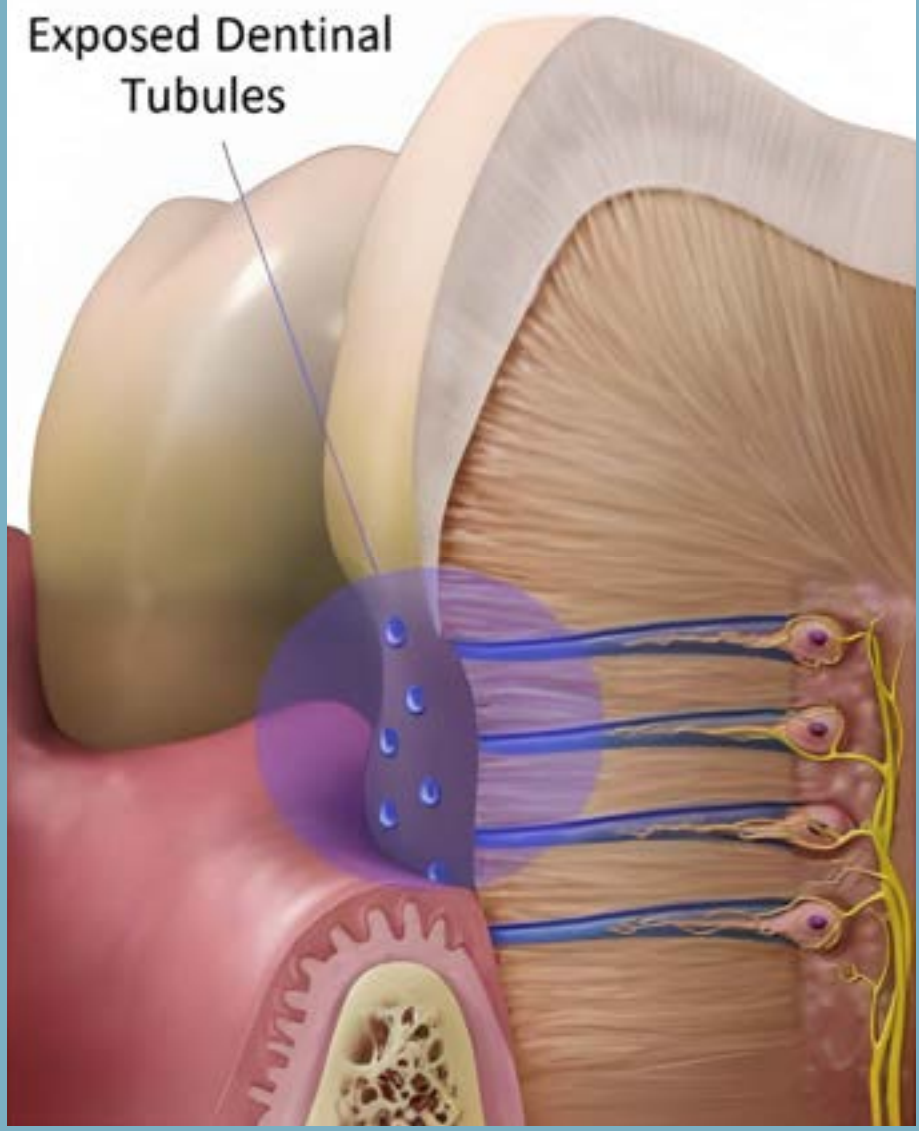
Anatomy Review: PULP & NERVES

- Pulp
  - Highly innervated with nerve cell fiber endings
- Odontoblasts
  - Located adjacent to pulp
  - Odontoblastic processes extend minorly into dentinal tubules- Tomes Fibers
- Nerve
  - Nerve fiber endings wrap around the odontoblastic processes in the dentinal tubules



DENTINAL HYPERSENSITIVITY PHASES

- Phase 1
  - Dentin loses its protective cementum covering
    - Lesion initiation
- Phase 2
  - Leads to exposure of dentinal tubules to the oral environment
    - Lesion localization

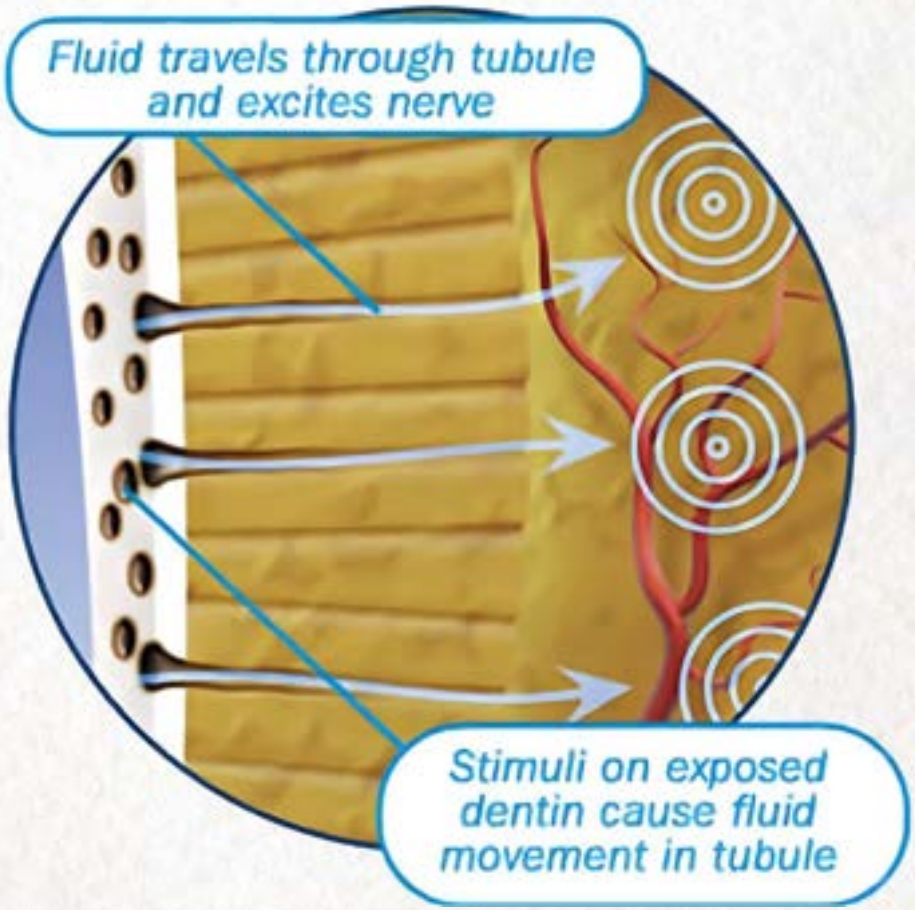


Hydrodynamic Theory

Stimulus to the outside of the dentin layer causes movement of fluid within the dentinal tubules

Movement of fluid creates pressure on nerve endings and transmits the pain to the pulpal nerves

Hypersensitive teeth have more **widened** dentinal tubules than non-sensitive teeth



CAUSES OF HYPERSENSITIVITY

Tactile

- Contact with solid material
  - Toothbrush, eating utensils, dental instruments

Thermal

- Temperature change
  - Hot or cold
    - Cold is most common

Osmotic

- Change in pressure within dentinal tubules through a selective membrane

Evaporative

- Dehydration of oral fluids
  - When using high volume evacuation
  - Application of air to dry teeth

Chemical

- Acid or acidic products in oral cavity
  - Food or beverages
  - Acids produced by bacteria after exposure to carbohydrates
- Gastroesophageal reflux
- Whitening agents

ETIOLOGY OF HYPERSENSITIVITY

RECESSION

- Loss of gingival tissue resulting in exposure of the root surface
- Causes of recession:
  - Aggressive oral care habits
    - Medium to hard bristle toothbrush
  - Laceration or abrasions
  - Metal oral piercings
  - Genetic or anatomical factors
  - Orthodontic treatment
  - Surgical procedures
  - Restorative procedures that abrade gingival tissue

LOSS OR DAMAGE TO TOOTH STRUCTURE

- Damage or loss of tooth structure can be multifactorial
- Enamel and cementum do not always meet
  - Occurs in about 5-10% of teeth
- Mechanical or chemical damage to tooth

ABFRACTION

- Mechanical tooth loss at the gingival margin
- Caused by flexing of the tooth at the weakest point
- Results in weakened tooth structure

EROSION

- Loss of tooth structure due to acid exposure in the oral cavity
  - Results in immediate drops in pH levels
- pH should come back to neutral in a few minutes
- Repeated or prolonged acid exposure can have severe consequences
  - Holding/swishing foods or beverages in your mouth, snacking or drinking throughout the day
- Gastric acid erosion is more likely seen on linguals of teeth

ABRASION

- Wear of enamel, dentin, or cementum due to mechanical habits
- Can be exacerbated by acid erosion

ATTRITION

- Wear of the enamel at the incisal or occlusal surface of the tooth
- Commonly the result of bruxism
- Exacerbated by acid erosion

OTHER FACTORS

- Instrumentation
- Overuse of abrasive materials
- Whitening
- Root surface caries

DETERMINING OTHER CAUSES OF HYPERSENSITIVITY

DIFFERENTIAL DIAGNOSIS

- Ruling out other causes of pain to determine cause and treatment plan
- Done through the use of interviewing techniques and diagnostic tests

What questions do you think you should ask the patient?

PATIENT INTERVIEWING TECHNIQUES

- Use open-ended questions
- Questions should cover
  - Teeth affected
  - Onset of the pain
  - Impact of pain
- Some questions may be difficult for patients
- Describing the pain

ASSESSMENT

VISUALIZE

- Inspect the tooth and surrounding area

PALPATE

- Inspect the soft tissue around the tooth

EXPLORE

- Use the Shepard’s hook to feel the exposed area

CHECK OCCLUSION

- Use occlusal paper to check for heavy occlusal forces

ASSESSMENT CONTINUED

- Take a periapical radiograph
- Test percussion response
- Illuminate
- Thermal testing
  - Blowing air
  - Endo ice

DIFFERENTIATING DENTINAL SENSITIVITY FROM OTHER TOOTH PAIN

- Abscess
  - Potential swelling, severe pain, possible tooth mobility, possible drainage
  - Radiographic, visual, palpation exams
- Caries
  - Sweet sensitivity in addition to cold/hot
  - Pulpal caries can cause severe pain when chewing
  - Radiographic and clinical diagnosis
- Fractured tooth
  - Thermal sensitivity and pain on pressure
  - Transillumination, occlusal examination
- Occlusal Trauma
  - Recent restorations placed that are “hitting high”
  - Malocclusion resulting in mobility of teeth
  - Occlusal examination with articulating paper

DIFFERENTIATING DENTINAL SENSITIVITY FROM OTHER TOOTH PAIN

- Pulpitis
  - Severe, intermediate, throbbing pain
  - Responds to thermal, electric pulp tests, and percussion
- Sinus infections
  - Non-descript tooth pain
  - Commonly in maxillary posterior teeth
  - Radiographic examination to rule out infection
- Galvanic pain
  - Sudden, sharp stabbing pain on tooth-to-tooth contact with dissimilar metals
- PDL Inflammation
  - Pain on chewing
  - Clinical examination should include palpation for apical tenderness
  - Responds to percussion tests

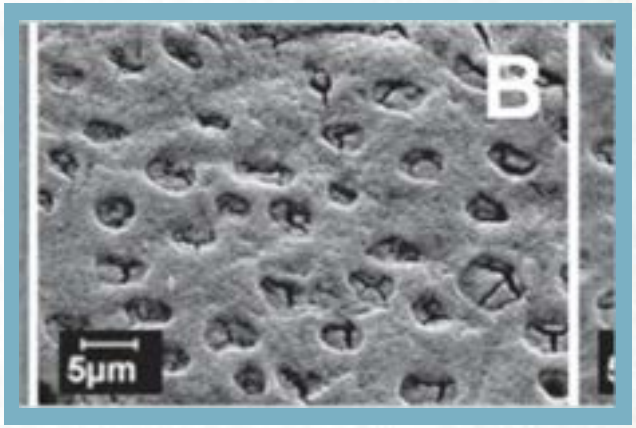
NATURAL DESENSITIZATION

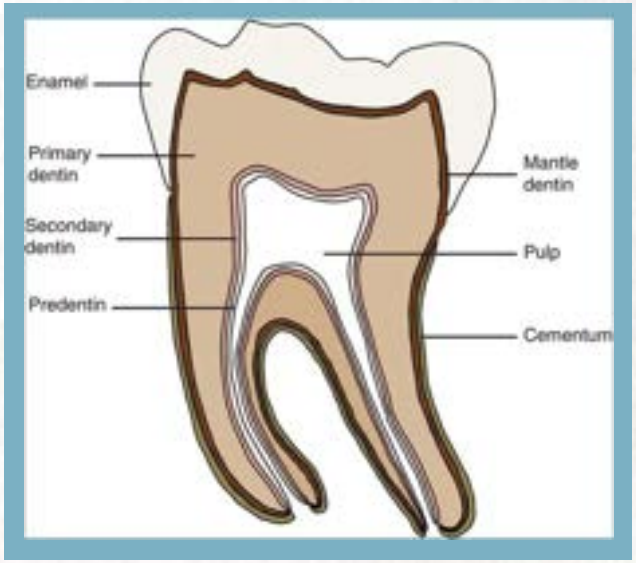
SCLEROSIS OF DENTIN

- Occurs by mineral deposits within tubules due to traumatic stimuli
- Creates mineralized layer of intratubular or peritubular dentin
- Mechanism of action: Decreased Lumen Size

SECONDARY DENTIN

- Accumulates over time on the floor and roof of the pulp
- Leads to smaller pulp chamber with less nerve endings





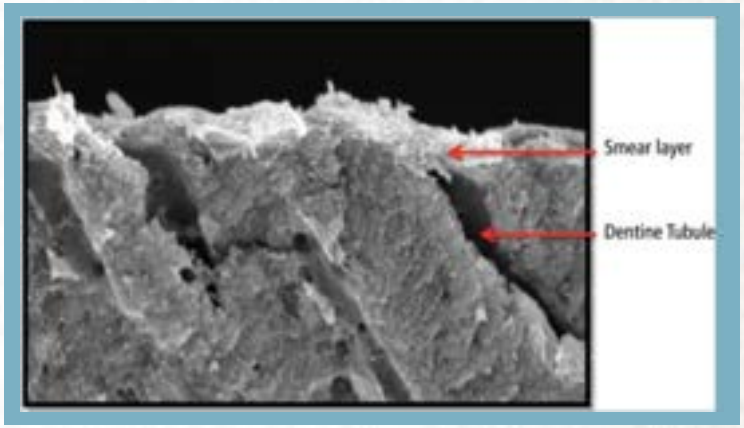
NATURAL DESENSITIZATION

SMEAR LAYER

- Organic and inorganic debris
- Mechanism of action: Occludes dental tubules
- Creates a natural “bandage” that blocks stimuli
- Builds up from scaling and root debridement, abrasive toothpaste particles, drilling, attrition, and abrasion
- Can be disrupted by mechanical effects and acid exposure

CALCULUS

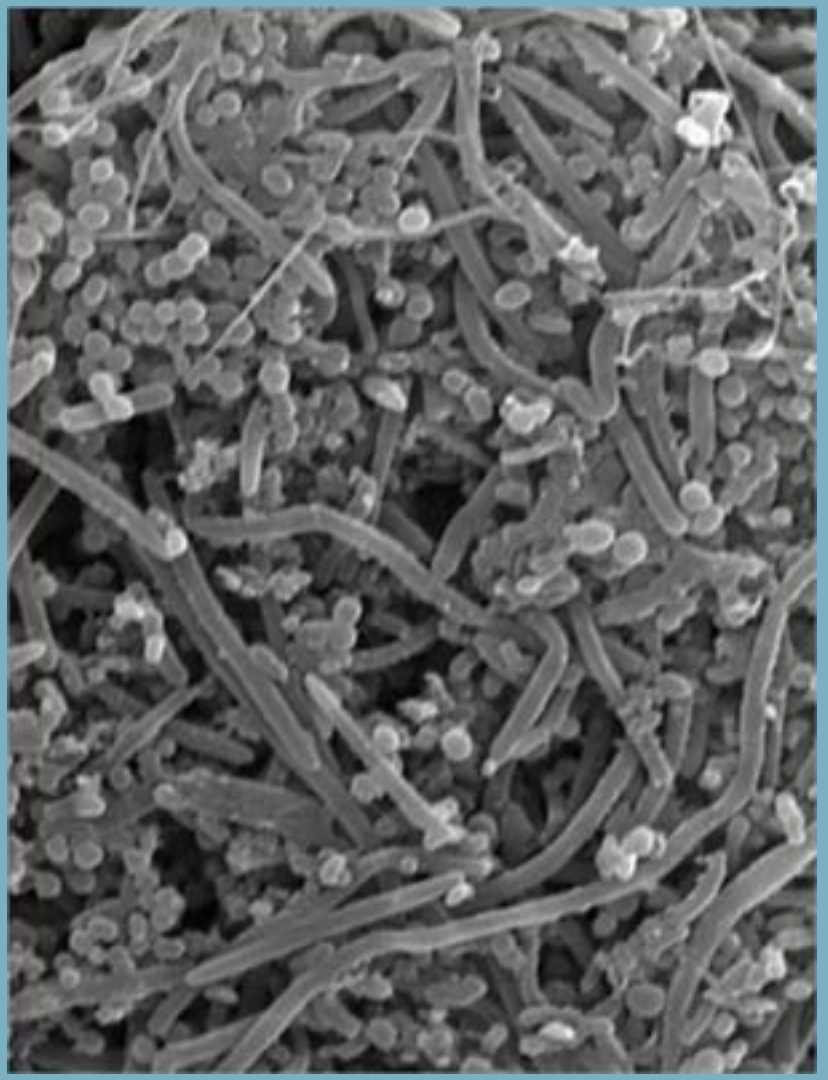
- Provides protective layer over exposed dentin; removal causes exposure



TREATMENT INTERVENTIONS

BIOFILM REMOVAL

- Biofilm presence increases size of dentinal tubules up to 3X
- Potential for increased sensitivity
- Biofilm control results in 20% reduction in lumen size
- Amount of biofilm does not equal amount of sensitivity



TOOTHBRUSHING STATUS

- Electric vs Manual
- Toothbrushing technique
  - Modified Stillman's for recession
- Bristles status and pressure

TRAUMATIC OCCLUSION

- Assessment of bruxism and clenching
  - Question the patient about habits and stress
  - Teeth should occlude only when eating and swallowing
- Potential treatment
  - Occlusal adjustments
  - Orthodontic treatment
  - Occlusal Guard

DIET MODIFICATIONS

- Nutritional counseling
- Evaluation of diet history is important
- Determining if erosion due to diet is a factor of the sensitivity
- Acid in foods includes:
  - Citrus juices, fruit, carbonated drinks, wine, cider, energy drinks coffee, etc.
- Erosion is permanent enamel loss

DESENSITIZATION AGENTS: POTASSIUM SALTS

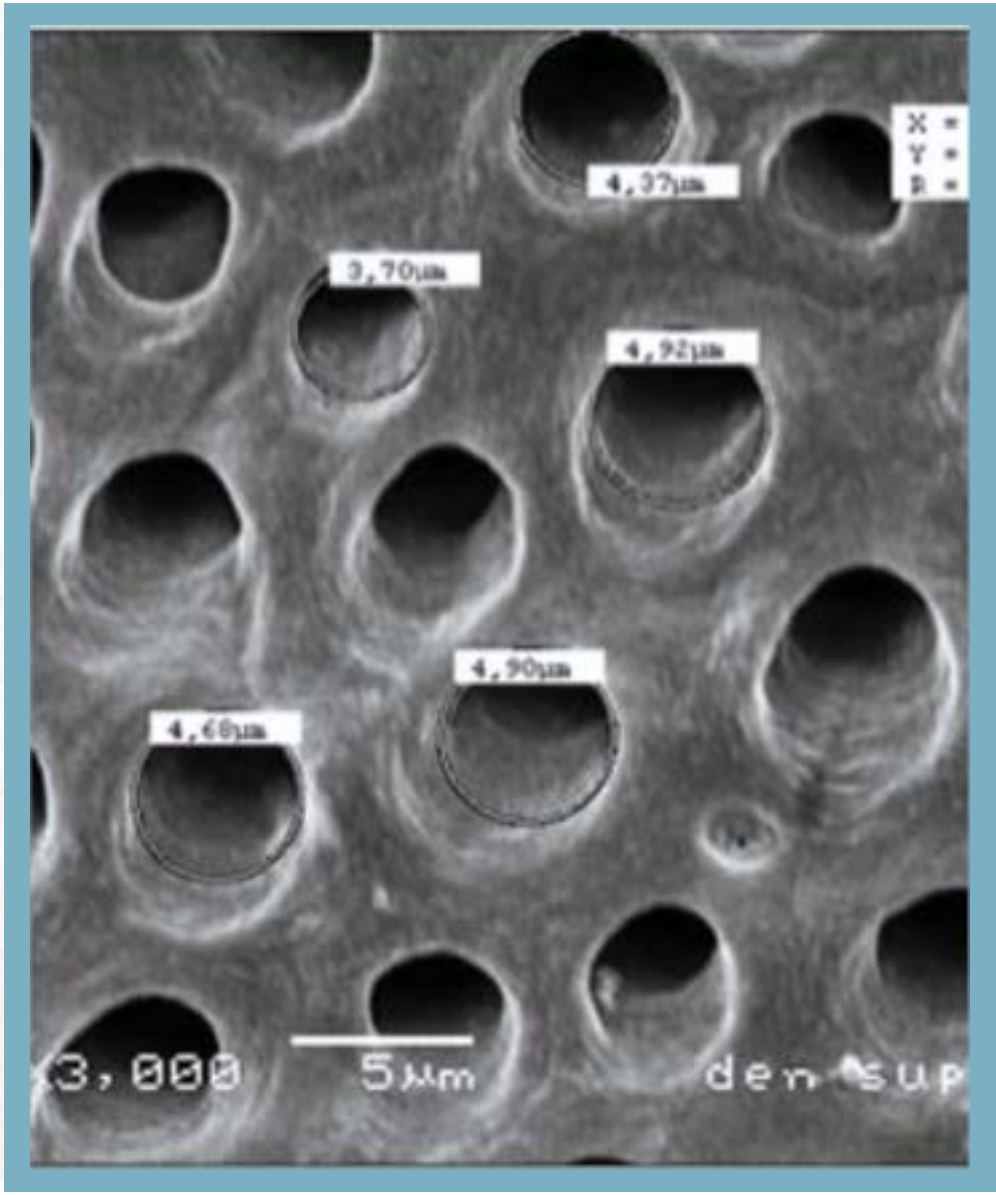
- Move through/along the dentinal tubules
  - Block the action of interdental nerve fibers
- Increase the threshold for stimulus reaction
  - Essentially depolarizing the nerve
- Examples: Potassium citrate, potassium nitrate, potassium chloride, potassium oxalate

DESENSITIZATION AGENTS: FLUORIDE

- Occludes tubules through smear layer formation
- Resistant to acidic foods and beverages
- Said to reduce sensitivity in 2 weeks
- Examples: Sodium Fluoride & Stannous Fluoride

DESENSITIZATION AGENTS: OXALATES & GLUTARELDEHYDES

- Oxalates
  - Occlude open tubules
  - Decrease tubule opening
  - Examples: potassium oxalate and ferric oxalate
- Glutaraldehyde
  - Decreases tubule opening
  - Coagulation of proteins and amino acids within the tubule



DESENSITIZATION AGENTS: CALCIUM PHOSPHATE TECHNOLOGY

- Caries prevention through remineralization of tooth structures
- Remineralization lessens sensitivity by occluding tubules

DESENSITIZATION AGENTS: CALCIUM PHOSPHATE TECHNOLOGY

1. Amorphous Calcium Phosphate (ACP)
    - Blocks tubules with calcium and phosphate precipitate
    - Enhances fluoride delivery
    - Remineralization of eroded/abraded hard tissue
2. Calcium Sodium Phosphosilicate (CSP)
    - Contains sodium, silica, calcium, and phosphorous
    - Bioactive glass particles releases calcium and phosphate that crystallizes into protective hydroxyapatite layer

DESENSITIZATION AGENTS: CALCIUM PHOSPHATE TECHNOLOGY

1. Casein Phosphopeptide (CPP)-ACP
    - Milk-derived protein
    - Useful during acidic food/beverage presence

1. Tricalcium Phosphate (TCP)
    - Developed to combine a calcium material that coexists with fluoride
    - Aims to provide greater effectiveness that fluoride alone

DESENSITIZATION AGENTS: ARGININE

- Amino acid present in saliva
- Occludes dentinal tubules
- Remains after acid exposure
- Prophy paste:
  - Can be used prior to dental treatment
- Over the counter options

TOPICAL AGENTS: DENTIFRICES

- Over the counter
  - Available in 5% potassium nitrate, sodium fluoride, or stannous fluoride
- Prescription
  - Highly concentrated fluoride (5,000 ppm)
  - Combined with abrasive to reduce extrinsic staining
  - Examples: Clinpro & PreviDent

TOPICAL AGENTS: GELS

- Highly concentrated fluoride (5,000 ppm)
- Good for generalized or localized sensitivity
  - Spot treatment
- No abrasive agents for biofilm removal or extrinsic stain control
- Require use of custom fluoride or bleaching trays
- Good option for patients with a history of radiation treatments for head and neck cancer

IN-OFFICE PROCEDURES

FLUORIDE AGENTS: VARNISH

- 5% sodium fluoride varnish provides prolonged exposure to tooth surface
- Tooth serves as a reservoir and releases fluoride ions in response to changes in oral acidity levels
- Occludes dentinal tubules

FLUORIDE AGENTS: SILVER DIAMINE FLUORIDE (SDF)

- Directed for use as a desensitizing agent
  - Used off label for arresting caries
- Silver functions as an antimicrobial agent
- 38% fluoride
- Mechanism of Action:
  - Protein layer formation
  - Partially occludes dentinal tubules
- Considerations: turns carious lesions black

5% GLUTARALDEHYDE AND OXALATES

- 5% Glutaraldehyde
  - Applied with micro-brush to specific sensitive site
  - Isolate tooth as solution can irritate soft tissue
  - Works by decreasing lumen size
- Oxalates
  - Burnished into a dried tooth surface
  - Provides immediate/short-term relief
  - Not intended for long term relief
  - Will require adjunctive therapies for long-term sensitivity issues

UNFILLED AND PARTIALLY UNFILLED RESINS

- Covers dental tubules
- Requires acid etching prior to placement
- Removes the smear layer and can cause discomfort
- Tooth surface must be dry for placement
- Consider local anesthetic to manage discomfort

DENTIN-BONDING AGENTS

- Seals dental tubule openings
- No acid or drying required
- May protect from erosion for 3-6 months

GLASS IONOMER CEMENT AND RESTORATIVE MATERIALS

- Can be placed in the presence of moisture
- Blocks dental tubule opening
- Releases fluoride to tooth

IONTOPHORESIS & SOFT TISSUE GRAFTING

- Iontophoresis
  - Low voltage electrical currents
  - Drives negatively charged fluoride ions further into the dentinal tubules

- Soft Tissue Grafting
  - Surgical placement of soft-tissue over a sensitive area.
  - Need adequate bone to support graft
  - Expensive & time-consuming

LASERS

- Nd:YAG obliterates dentinal tubules
  - “melting and resolidification”
  - Hygienists cannot use Nd:YAG
- Diode laser
  - Mechanism of action not completely understood
  - Shown to be more effective than fluoride treatment alone in reducing sensitivity
  - Can use sodium fluoride varnish after procedure for increased effects

PROFESSIONAL INSIGHT & COMMITMENT

CONSIDERATIONS

Fractures

- Difficult to diagnose on rads
- Potential for crown, endodontic treatment, or extraction

Tooth Whitening

- Reversible pulpitis
- Sensitivity may decrease on its own over time
- Recommend desensitization products in combination with whitening

Scaling & Root Debridement

- Explain potential for sensitivity before starting treatment
- Local anesthetic, topical anesthetic, or nitrous oxide may help with patient comfort
- Post-procedure desensitizing and education on home-care

Diet-Nutritional Counseling

- Inquire about changes in dietary habits – especially energy drinks
- Make recommendations for changes or modifications

RECOMMENDATIONS

- One size does not fit all
- Mix products
- In-office, OTC, and RX
- Importance of home care
- Gauge your patient

DOCUMENTATION

- Identification of sensitive areas
- Oral findings and habits
- Differential diagnosis
- Recommendations
- Patient acceptance and implementation
- Patient compliance and outcomes

REASSESSMENT

- Evaluate treatment interventions
- Allow 2-4 weeks before evaluating the effectiveness of treatment recommendations
- If the patient persists, assist the patient with other options.

SUMMARY

RECOGNIZE & DISTINGUISH

Understand dentinal hypersensitivity, its causes, and how to differentiate it from other conditions

RECOMMEND TREATMENTS

Recommend and apply appropriate in-office and at-home treatments to manage patient sensativity

EDUCATE & SUPPORT

Educate patients on improving comfort and supporting oral health through individualized care

QUESTIONS