Dentinal Hypersensitivity

Dr. Shraddha Shah

Tutor,

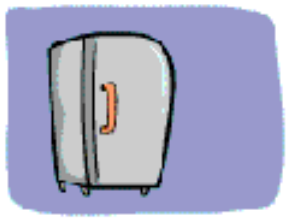
Dept. of Periodontology

Final year
Batch 2020-21

Contents

- Introduction
- Definitions
- History
- Etiology
- Mechanism of dentin sensitivity
- Theories
- Clinical considerations
- Methods of measuring hypersensitivity
- Management of hypersensitivity
- Summary & conclusion

Introduction



Definitions

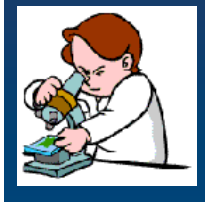
- Dentin hypersensitivity can be described as an adverse reaction or pain in one or more teeth resulting from either a thermal mechanism, or chemical stimulus – Clark 1985.
- Hypersensitive dentin is an uncommonly sensitive or painful response of exposed dentin to an irritation –Grossman 1935.
- It is one of the most painful, ubiquitous and least satisfactory treated chronic problems of teeth – Doran Zinner 1977.

Definitions

- Dentinal hypersensitivity is described clinically as an exaggerated response to non noxious stimuli. It is characterized by pain of short duration arising from exposed dentin in response to stimuli, typically thermal, evaporative, tactile, osmotic and chemical and which cannot be ascribed to any other dental defect or pathology

History

- Chinese… 2000 years or more by the application of ‘xiao-Shi’ believed to be niter or potassium nitrate, in about the third century B.C
- The Egyptian Medical Papyrus recommended a mixture of red and yellow vitriol and alum for "teeth that suffer"
- Rhazes …. in about 875 AD, …. pain asso with gum recession …treatment with astringent agents.
- Leeuwenhock, … ‘tooth canals’ in dentin… 1678



History

- In 1855 J.D.White ….dentinal pain was caused by movement of fluid in dentinal tubules
- Cartwright in 1857…. dentine sensitivity was observed when the affected tooth was struck and that some areas of the tooth were "exquisitely sensitive" and a source of great discomfort.
- ….chemical caustics (Copper sulphate; Mercury bichloride, silver nitrate, Zinc chloride, antimony chloride, arsenous acid) could be used to desensitize dentin

History

- In 1866 Francis presented "Sensitive Dentine" its cause and treatment…. cavity liners …. secondary dentin and …. a paste made of arsenous acid, tannin and Creosote.
- Alfred Gysi in 1900 stated unequivocally that dental canaliculi are devoid of nervous substances ….. the first to suggest relieving hypersensitivity by coagulating its protein content.

History

- In 1898, Henry H. Buchard provided a categorization of the three pharmacologic approaches for controlling the pain of dentin hypersensitivity.
  - ✓ *The administration of agents to lower the pain perceptive centers of the brain.*
  - ✓ *Use of agents to destroy or coagulate the dentinal protoplasm*
  - ✓ *Use of local analgesic agents on the dentin.*

History

- In the First half of the twentieth century Herman Prinz 1913 noted that arsenic was no longer used for reducing hypersensitivity since it invariably severely damages or destroys the dental pulp. Best results are obtained by the application of local anesthetics directly to the exposed dentin in prepared cavities.

History

- Louis J. Grossman in 1935 described hypersensitiveness in dentin
- King's speciality Co. in Fort Wayne, Indiana, in 1932, produced "Sensitex", a commercial desensitizing solution, sold to dentists. The active ingredient being Chloralum-oxy chloride and stated that it was a "magic wand" for treating sensitivity

History

- In 1941…. Lukomsky …. Sodium fluoride
- In 1943 Hoytt and Bibby….. Sodium fluoride, white clay and glycerin.
- 1956…Pawlowska …. strontium chloride combined with the bi-colloids of teeth ... favourable effect on hypersensitivity….. sensodyne tooth paste was formulated with strontium chloride hexahydrate.

History

- Gutentag…. Strontium ion
- Emoform tooth paste ….1940's…formaldehyde 1.4%, calcium carbonate 14%, magnesium carbonate 15% and a mineralising salt - mixture of sodium bicarbonate 3.4%, sodium chloride 1.45%, potassium sulfate 0.0075% and sodium sulphate 0.0075%

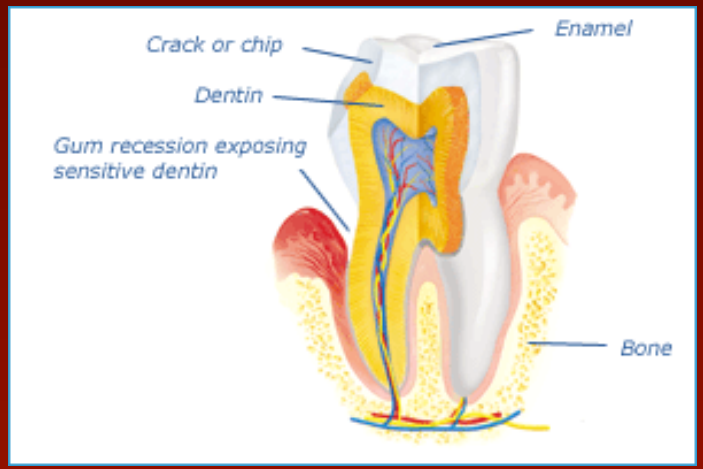
History

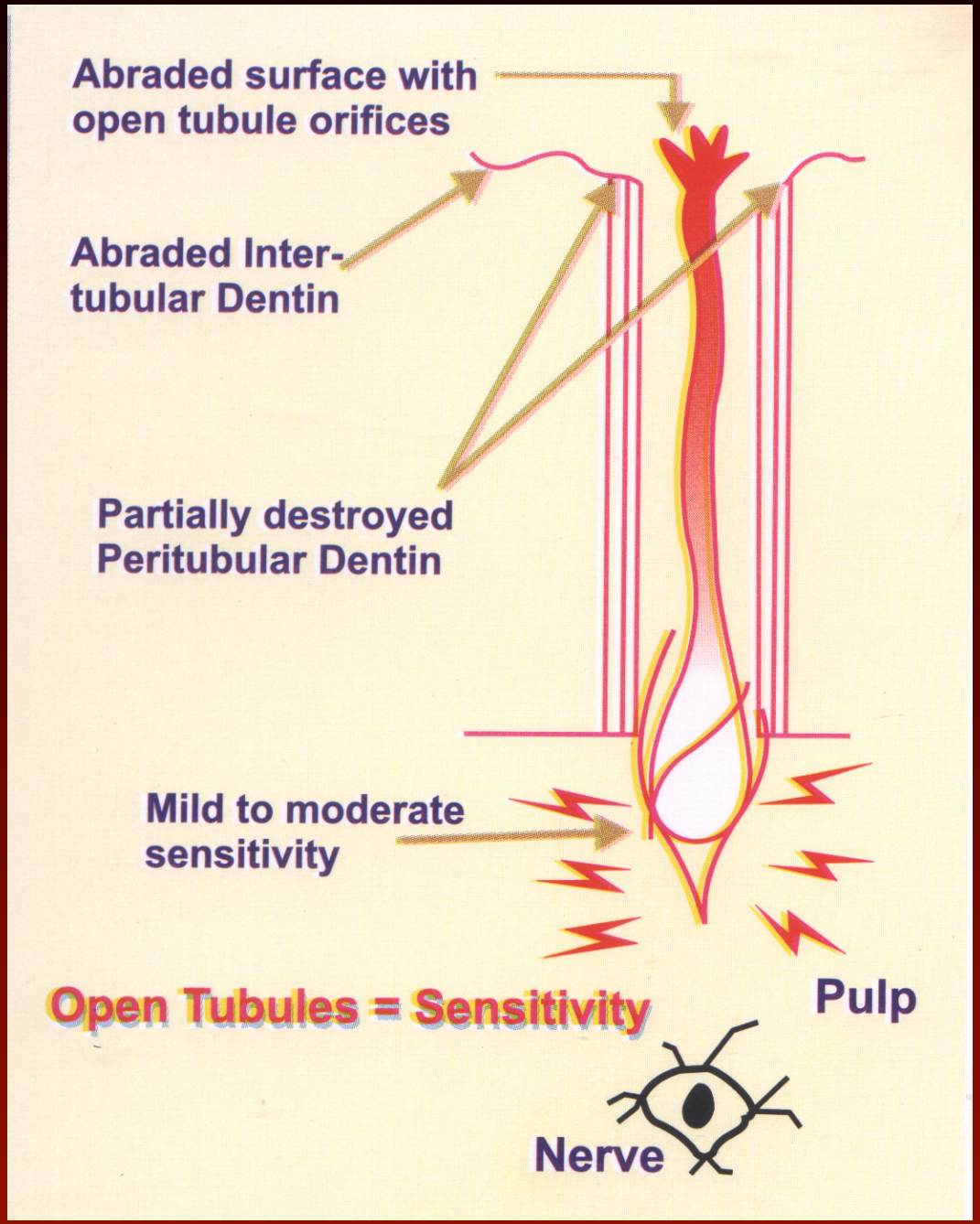
- In 1962 Brannstrom …. Hydrodynamic theory
- In 1966….. Therapies
  - ✓ *deposit an insoluble substance on the ends of the fibers or nerves to act as a barrier*
  - ✓ *To stimulate secondary dentin formation.*
- In 1974… Hodosh…superior desensitizer…..

  Potassium nitrate.

Etiology

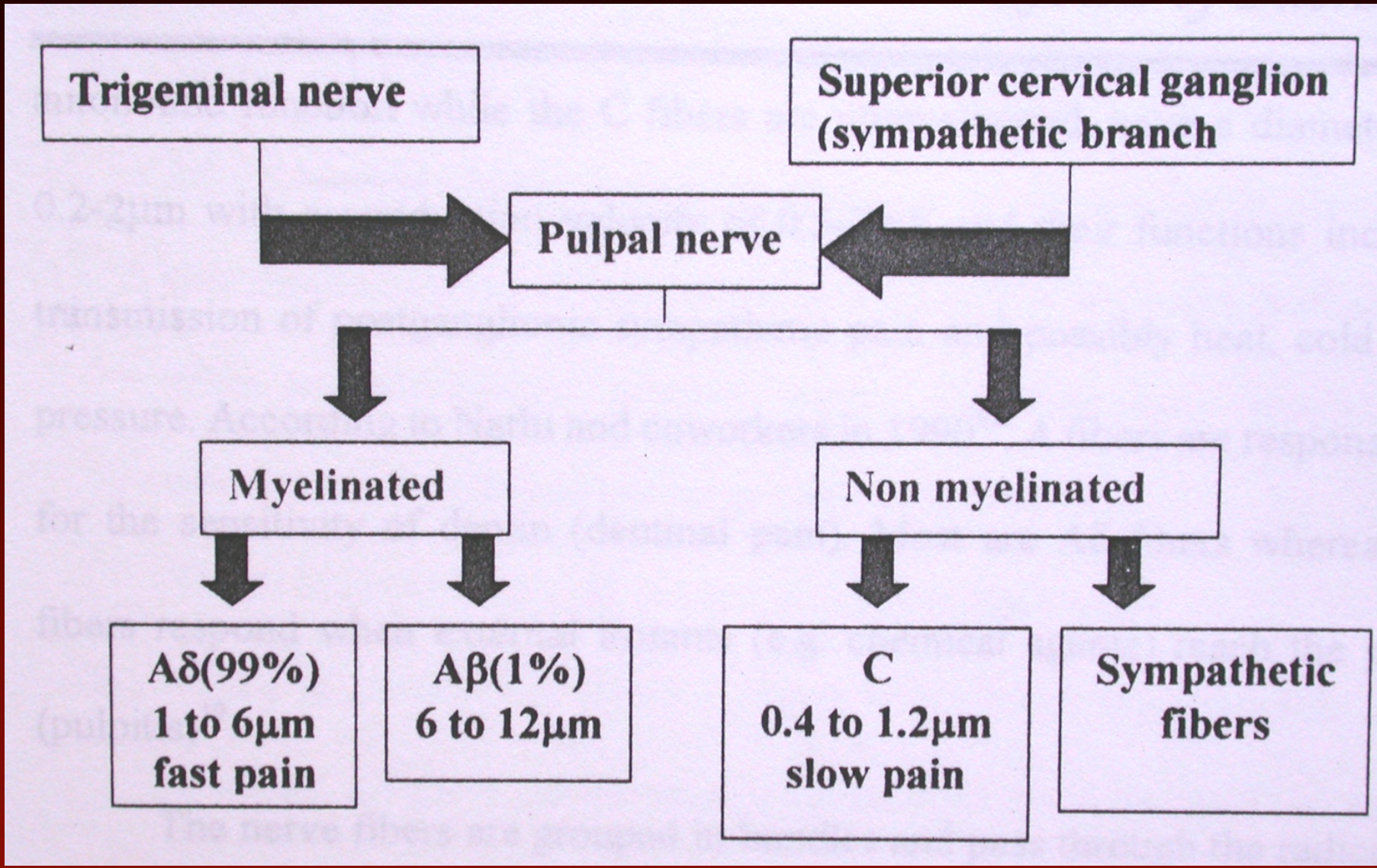
- Symptom complex…
- Exposure of dentin
  - ✓ *Removal of enamel…attrition, abrasion, erosion*
  - ✓ *Removal of cementum …. gingival and periodontal diseases, surgical procedures*
  - ✓ *Erosive agents……acids… environmental, dietary and endogenous.*
  - ✓ *Plaque*
  - ✓ *Manipulation of dentin surfaces*




Abraded surface with
open tubule orifices
Abraded Inter-
tubular Dentin
Partially destroyed
Peritubular Dentin
Mild to moderate
sensitivity
Open Tubules = Sensitivity
Pulp
Nerve

Mechanism of dentin sensitivity

- The dental pulp is richly innervated ….
  - ✓ *Myelinated … A fibers*
  - ✓ *B fibers… preganglionic autonomic function*
  - ✓ *Non myelinated… C fibers*
- A-ά… proprioception, A-β…touch & pressure, A-γ…motor func to spinal nerves and A-δ fibers…pain, temp & touch.


Trigeminal nerve
Superior cervical ganglion (sympathetic branch
Pulpal nerve
Myelinated
Non myelinated
Aδ(99%) 1 to 6µm fast pain
Aβ(1%) 6 to 12µm
C 0.4 to 1.2µm slow pain
Sympathetic fibers

Mechanism of dentin sensitivity

- A-delta and C-fibers ….. sub odontoblastic plexus….. nerve fibers extend to the odontoblastic layer, Predentin, dentin… free nerve endings
- A-δ…. Brief, sharp, well localized pain …. Dentinal hypersensitivity.
- C fibers… poorly localized pulpal pain.
- The sensitivity of nerve units depends upon the condition of dentin surface

Theories

- Direct stimulation
- Odontoblastic transducer mechanism
- Gate-control theory and vibration
- Hydrodynamic mechanism

Direct stimulation theory

stimuli initially excites
Nerve endings within the
dentinal tubule

parent primary afferent
nerve fibers

dental nerve branches

brain

odontoblasts … injured

neurotransmitting agents
vaso-active and pain
producing amines & proteins

Nerve fiber action potential
Increasing CAMP levels.

Direct stimulation theory

- Anderson's explaination
  - ✓ *No nerve elements…. Pain evoked due to stimulation of receptor mechanisms in the pulp by disturbance transmitted through the tubule by non neural means.*
  - ✓ *Receptor mechanisms in dentin that could be stimulated indirectly…no direct stimulation… barrier.*

Odontoblastic Transduction theory

stimuli initially excite the process
or the body of the odontoblasts

nerve endings in the pulp

excitation to these associated nerve endings.

- Synaptic like relation b/n the terminal sensory nerve endings & odontoblastic processes.
- No evidence of acetylcholine
- Proponents of dentinal receptor mechanism…. Odontoblasts has special sensory function and that a functional complex with the terminal sensory nerve endings … excitatory synapse…neurosensitive complex

Odontoblastic Transduction theory

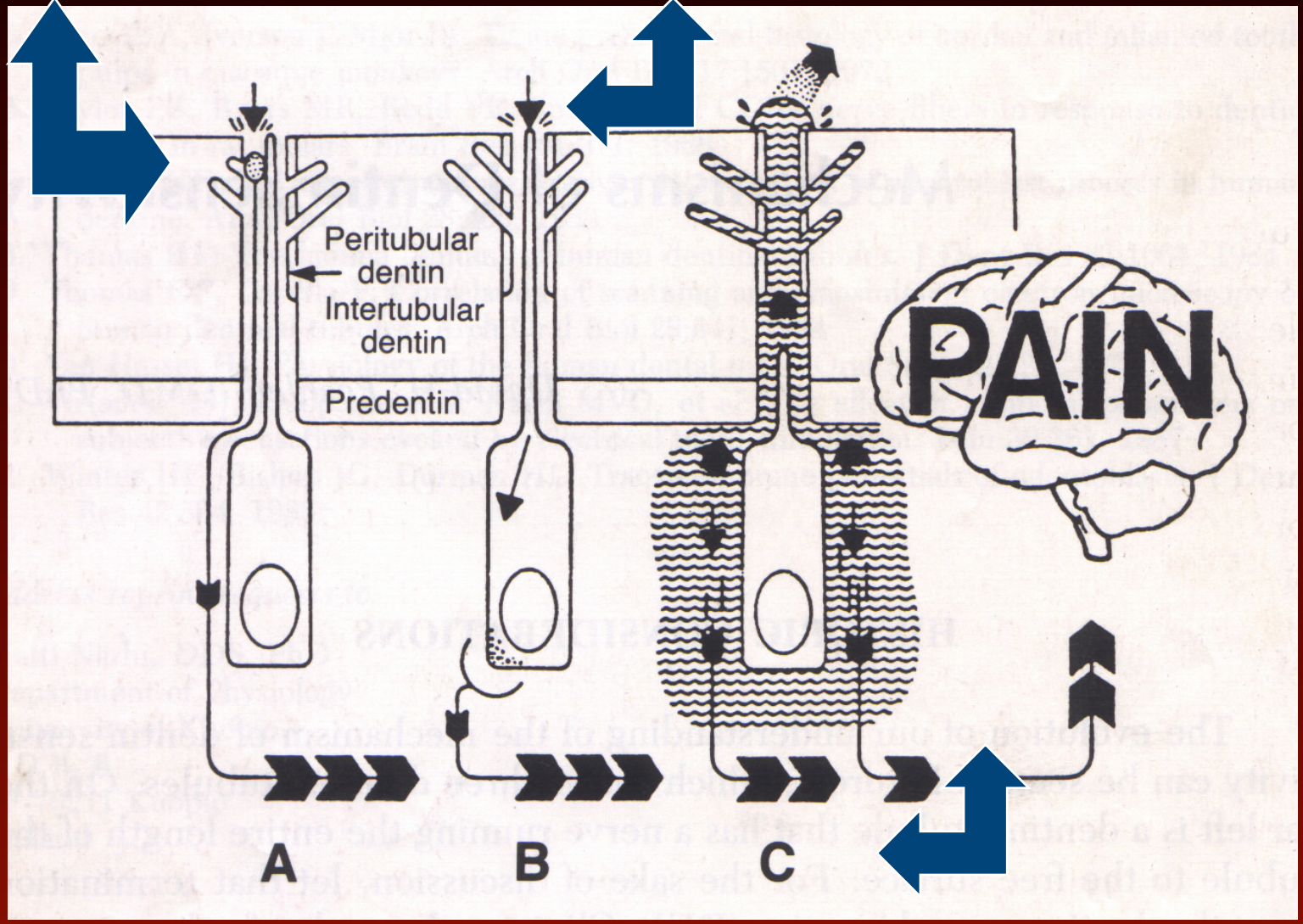
- Gunji, 1967 advanced the theory that odontoblasts and sensory nerve terminals form mechanoreceptors complexes which are responsible for dentin sensitivity.
- Bead like swellings…. Fibers meet the odontoblastic processes…. Mechanoreceptors… stmulated …. Odontoblastic process deformed.

Drawbacks

- Fails to explain why dentin continues to be sensitive, despite destruction of odontoblast layer.
- Also does not explain why protein precipitation does not decrease sensitivity of dentin to osmotic stimuli.
- Abandoned…. Failure to establish a synaptic relation between the odontoblasts and the pulpal nerves.

Direct stimulation

Odontoblastic transduction



Hydrodynamic theory

Gate control theory and vibration

- Vibrations…. pulpal nerves become activated
- larger myelinated fibres may accomodate to the sensations.
- The smaller c-fibre may tend to be maintained and not adjust to the stimulus
- the low intensity "pain gates" from the larger fiber are closed the high-extensity "pain gates" from the smaller fibers are enhanced.

Drawbacks

- Pain responses from the dentin are transmitted and perceived by the nerve endings of the pulp-only, how they may be centrally interpreted.

Hydrodynamic theory

- Fish in 1927 observed the interstitial fluid of the dentin and pulp …dental lymph
- Flow of this fluid …. outward or inward direction
- Fluid movement within the dentinal tubules is the basis for the transmission of sensations according to the hydrodynamic theory.

Hydrodynamic theory

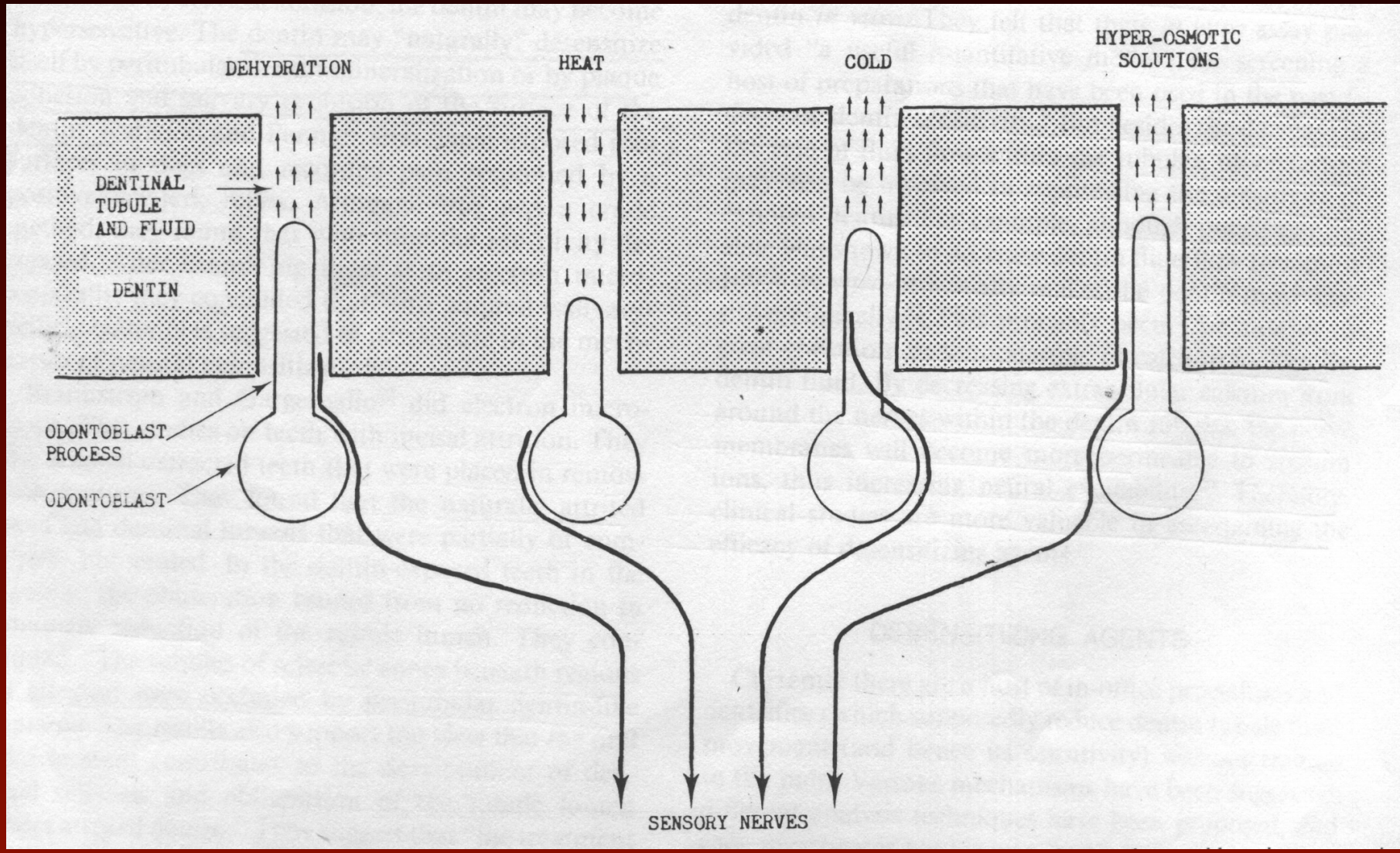
- Brannstrom and Astrom, a dentinalgia results from a stimulus causing minute changes in the fluid movement within the dentinal tubules … deform the odontoblasts or its process …. Pain …. mechanoreceptor-like nerve endings.

Hydrodynamic theory

- Two mechanisms
  - ✓ *Diffusion …… process by which substances are transported from an area of high concentration to an area of low concentration.*
  - ✓ *Convection, transport or filtration, bulk fluid movement occurs from an area of high hydrostatic pressure to an area of low hydrostatic pressure*

Hydrodynamic theory

- Hydraulic conductance of dentin ……
- The dehydration of dentin is probably the clearest example for understanding dentin sensation….
- When Brannstrom applied absorbent paper to exposed dentin, it caused pain, but no pain was elicited using wet paper
- Perception of acute thermal stimulation


DEHYDRATION
HEAT
COLD
HYPER-OSMOTIC SOLUTIONS
DENTINAL TUBULE AND FLUID
DENTIN
ODONTOBLAST PROCESS
ODONTOBLAST
SENSORY NERVES

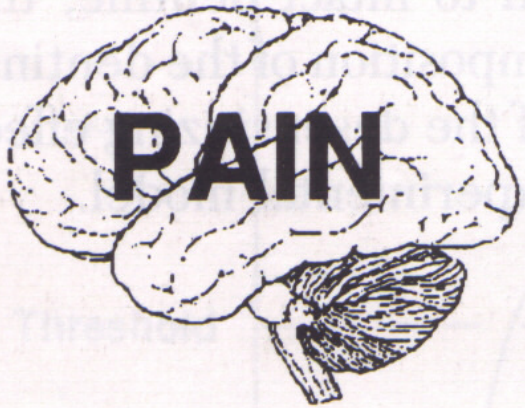
OPEN TUBULES

COLD, HEAT,
TACTILE STIMULI

DENTIN

DENTINAL TUBULES
FLUID MOVEMENT
WHICH STIMULATE
SENSITIZED NERVE
ENDINGS

ODONTOBLASTS



SENSORY
NERVES

PROSTAGLANDINS AND
OTHER MEDIATORS
MAY SENSITIZE

Alternative mechanism (Modified Hydrodynamic theory)

- Narhi in 1982, Kim in 1986 and berman in 1984 and other investigators….
- Application of various chemical solutions (in particular potassium containing compounds) to dentin resulted in raising the intratubular potassium content, which in turn rendered the interdental nerves les excitable to further stimuli by depolarizing the nerve fiber membrane.

Clinical considerations

- Excessive root planing …. sensitivity occurs after 7 to 10 days.
- The vestibular surface of teeth that are sensitive
- frequency of hyper sensitivity was premolar 38%, incisor canines 24% and molars 12%
- Hydraulic conductance…

Clinical considerations

- The chief symptom of dentinal hypersensitivity is a sharp, sudden pain of short duration although some patients complain of a dull, lingering sensitiveness
- Sensitivity to cold,
- Use of a tooth pick and/or brushing.
- Hot liquids and sweet or sour foods may evoke a response.

Physiologic & pathologic pulpal defense mech

- Formation of secondary dentin
- Hall…. Pulpal calcification
- Peritubular dentin calcification… dentinal sclerosis
- Natural occlusion of the peritubular dentin by calcium crystals
- Plaque adhesion and salivary occlusion of the surface of the dentin

Methods of measuring dental hypersensitivity

- Currently no single method of eliciting and assessing dental hypersensitivity may be considered ideal.
  - ✓ *Tactile sensitivity method*
  - ✓ *Thermal Sensitivity*
  - ✓ *Electrical Sensitivity*
  - ✓ *Osmotic Sensitivity*
  - ✓ *Chemical Sensitivity*

Methods of measuring dental hypersensitivity

- Subject Assessment

1. Verbal rating scale is a simple descriptive pain scale which includes the following:

- 0 – No discomfort
- 1 – Mild discomfort
- 2 – Marked discomfort
- 3 – Marked discomfort that lasted for more than 10 seconds.

Methods of measuring dental hypersensitivity

2. Visual analogue scale is a line 10 cm in length, the extremes of the line representing the limits of pain, a patient might experience from an external stimulus.
3. McGill pain questionnaire – the patient is shown 20 sets of words and asked to select a word from each set which best describes the present pain experience.

Application of stimuli

- Whatever methods are used they should be quantifiable and reproducible.
- Should be designed to elicit dental pain in preference to pulpal pain.
- When more than one stimulus is used the order of application of the stimulus is important.
- The least disturbing stimulus should be used first, with the most disturbing stimulus used last

Application of stimuli

- Testing should begin with subject assessment and then followed by tactile, heat and cold stimuli.
- Control of extraneous factors that could potentially influence subject response is important.
- Standardized instructions and stimulus demonstration should be given.
- The examination room should be free of distractions caused by noise, music, lights, temperature and so on.
- The examiner should avoid fear generating procedures.

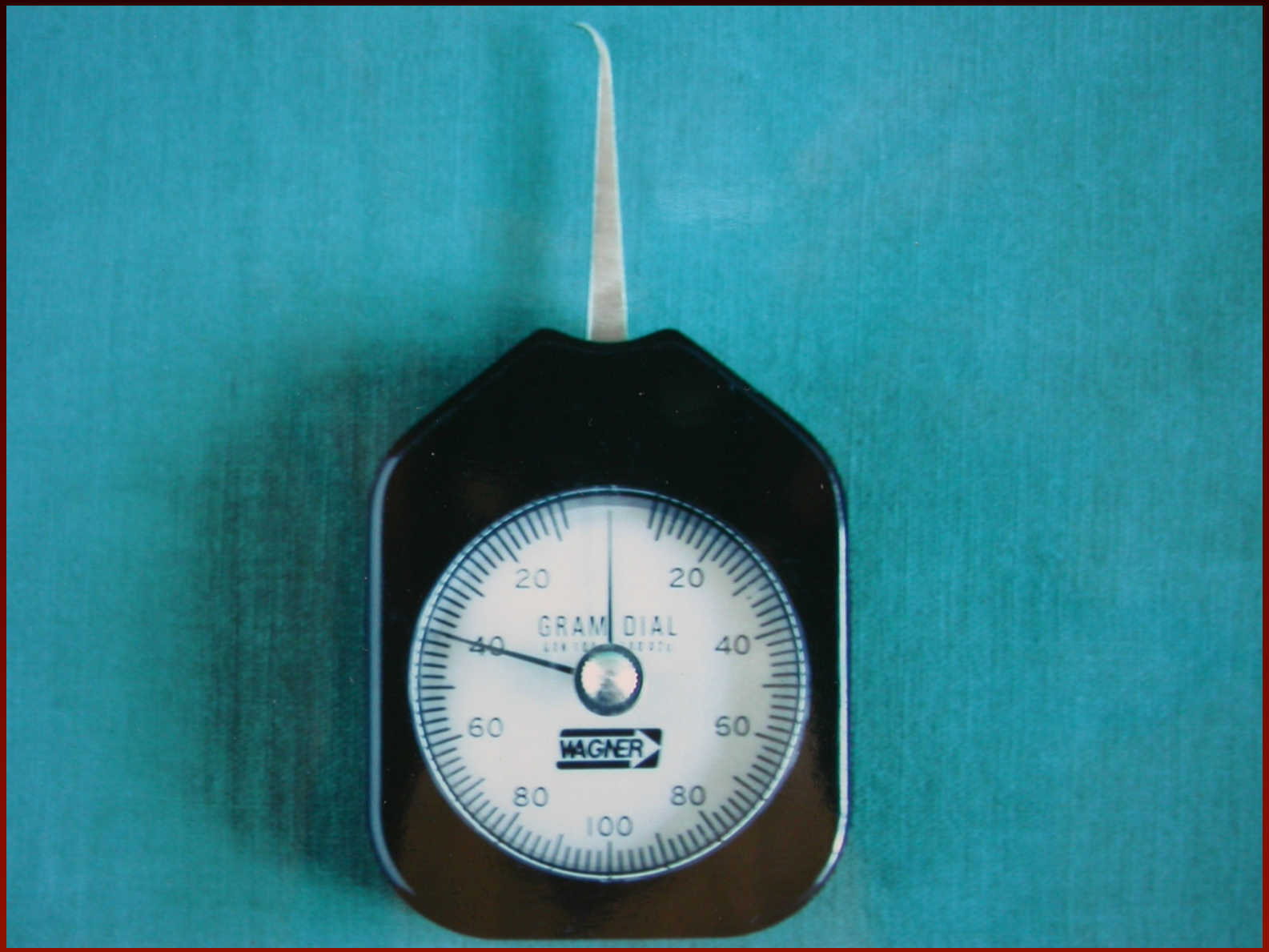
Mechanical or tactile stimuli

- Pass a sharp dental explorer… grade the response …..scale 0 – 3
  - ✓ *Collins used a no 23 explorer*
  - ✓ *Simple yet effective*
  - ✓ *5 – 10 gm of force…Tip of the explorer … 500/ nm2… compression and deformation of dentin*
- Incorporating a calibrated strain gauge in the explorer
- Using a Yeaple probe…. Compact handpiece that contains an explorer tine … electromagnetic field.

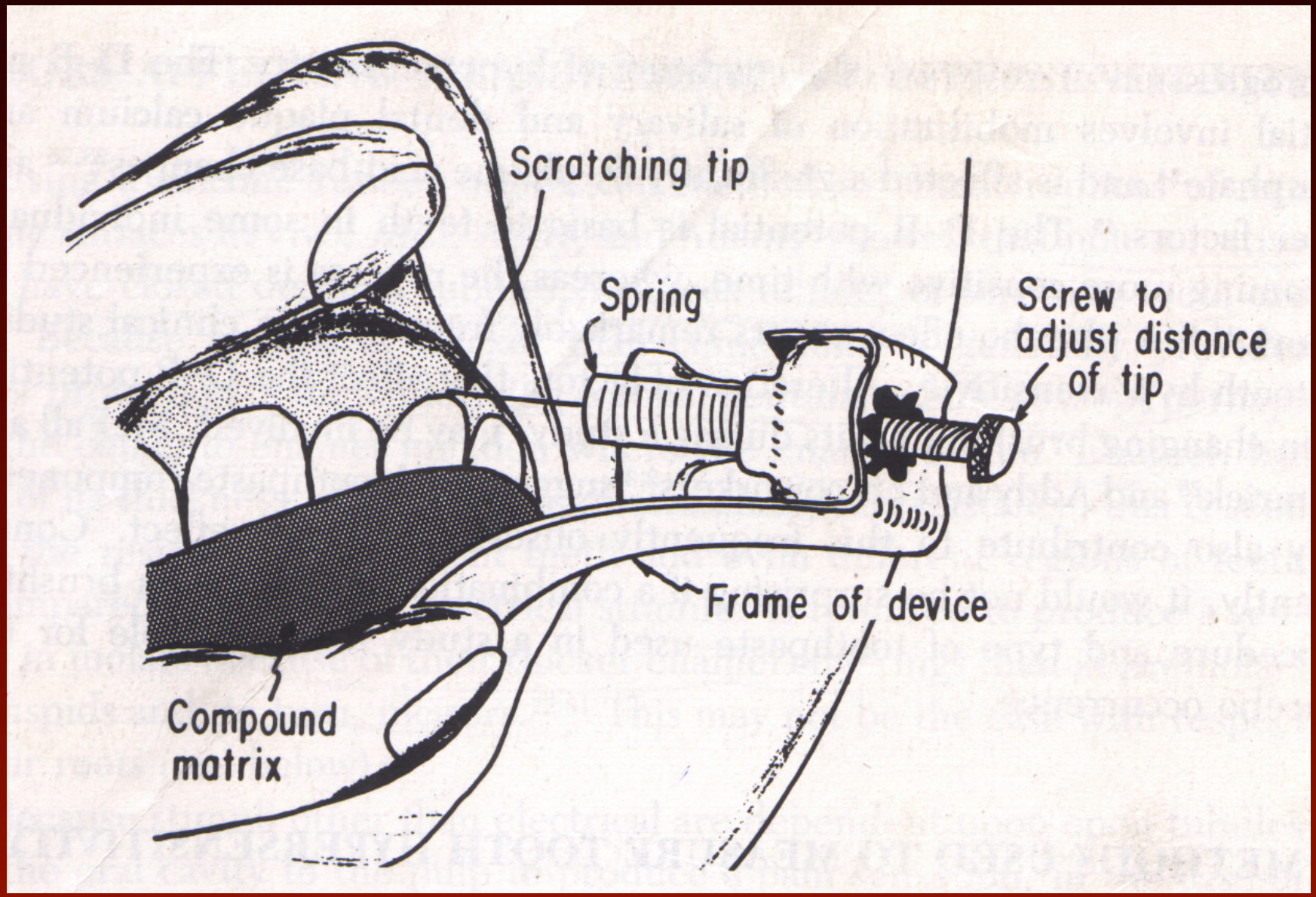
Mechanical or tactile stimuli

- Hand held scratch device… Dr Kleinberg
  - ✓ *Torsion gauge*
  - ✓ *Sharp explorer like probe*
  - ✓ *Indicator …Records the force of displacement in centinewtons*
  - ✓ *Probed at CEJ*
  - ✓ *A tooth that fails to respond at 80 centi-newtons is non sensitive.*

Scratchometer



Scratch device



Drawbacks of tactile method

- Testing and measuring tactile sensitivity levels depends on the patience and expertise of the investigator.
- The force should be applied gradually and
- Only specific spots in a given cervical exposed dentine area will be tactily sensitive

Thermal Sensitivity

- Directing a burst of warm temperature air from a dental syringe onto the test tooth
- One second blast from the air syringe …. temperature is b/n 65^0 and 70^0F and at a pressure of 60 psi
- 0 - No discomfort
- 1 - Mild discomfort, but no severe pain
- 2 - Severe pain when stimulus is applied
- 3 - Severe pain occurs and persists even after removal of stimulus

Thermal Sensitivity

- An air thermal device devised by Dr. K.C. Yeh
- used a temperature controlled stream of air as the stimulus.
- Air was heated to 100^0F close to temperature of the mouth. Its temp was then reduced until the subject felt pain or discomfort.
- The Yeh device had a disposible plastic tip, and air emitted at 10 psi could be adjusted to between 100^0 and 70^0F within about 2 minutes.

Thermoelectric device

- Devices…. Electrical cooling or heating of direct contact metal probes.

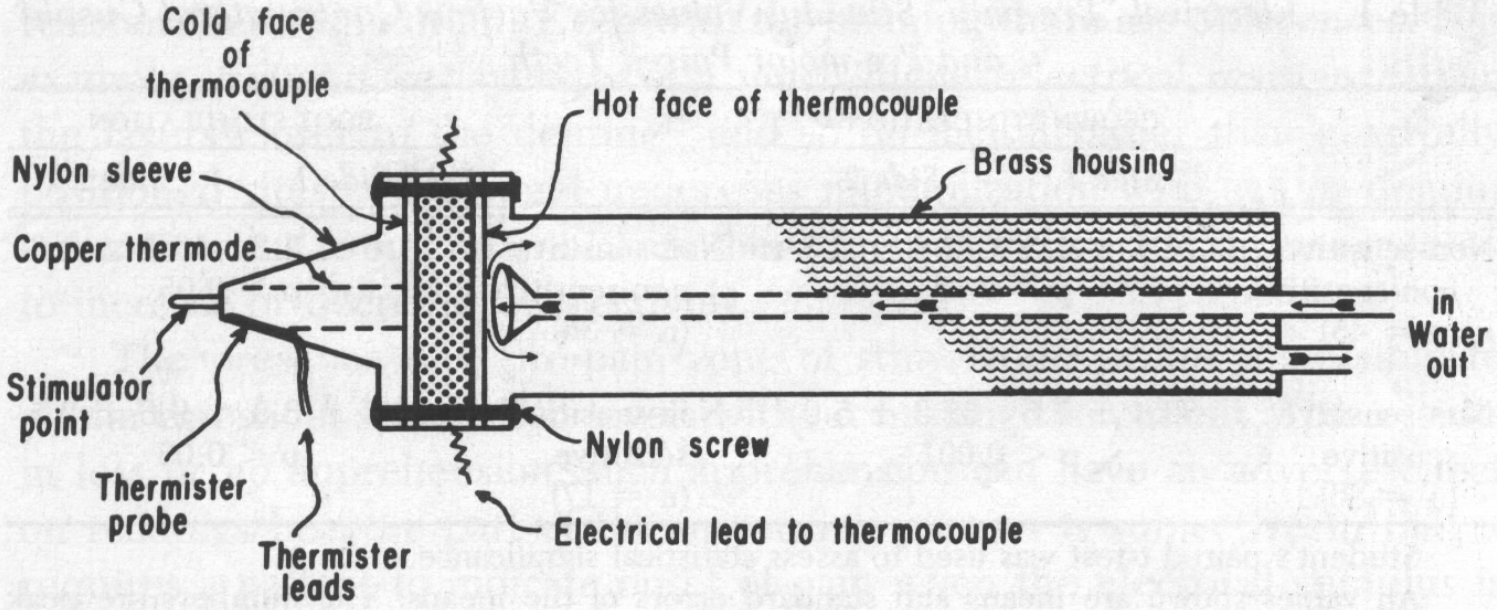


Figure 3. Diagram of the thermo-electric device used by Smith and Ash to apply a hot or cold stimulus to sensitive teeth to elicit a pain response. (*Adapted from* Smith BA, Ash MM Jr: Evaluation of a desensitizing dentifrice. J Am Dent Assoc 68:639, 1964.)

Thermal Sensitivity

- Clinically, cold stimuli are more useful than hot stimuli. Cold air & cold liquids….
- Patients tolerate cold stimuli better than hot stimuli, and there is less danger of causing pulpal damage.
- Cold water testing technique….

Electrical sensitivity

- Non physiologic… evaluates the presence or absence of nerve vitality
- …electro-osmosis.
- Advantages of using electrical stimuli are that
  - ✓ *1. The patients sensation of warmth or tingling is taken as threshold, which is described as prepain or non pain sensation and,*
  - ✓ *2. It can be precisely defined by electronic method.*

Stark instrument for electrical stimulation

Osmotic sensitivity

- An osmotic method….. McFall and Hamrick
- Fresh saturated solution of sucrose and allowing it to reach room temperature
- Solution is then applied to the root surface of the tooth and allowed to remain in place for 10 sec
- Sensation was rated as pain or no pain which was recorded as 0 or 1
- stopped by rinsing with warm water

Osmotic stimuli

- Popularized by Anderson and his colleagues
- Effective because the chemical activity of water in these solutions is less than the chemical activity of water in dentinal fluid
- Calcium chloride excites intra dental nerves owing to osmotic movement of fluid
- Sodium chloride excite nerves owing to indirect osmotic effects on superficial dentin & direct effects on intra dental nerves in deep dentin.

Chemical sensitivity

- Used in clinical hypersensitivity studies
- Stimulus is not conducive to threshold measurement because repeated applications of the chemical stimulus reduce the sensitivity of the exposed dentin.

Chemical sensitivity

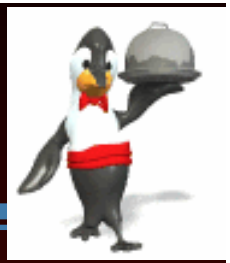
- Drawbacks

1. Inconvenience
2. Difficulty in administering and controlling the stimulus
3. Injury to the adjacent soft tissue.

Differential Diagnosis

- Cracked tooth syndrome.
- Fractured restorations.
- Chipped teeth.
- Dental caries.
- Post-restorative sensitivity.
- Teeth in acute hyper function.

Management of hypersensitivity



- Fluid formation of a smear layer by burnishing the exposed root surface.
- Topical applications of agents that form insoluble precipitates within the tubules
- Impregnation of tubules with plastic resins.
- Application of dentin bonding agents to seal off the tubules.

Management of hypersensitivity

- Most agents that are effective in reducing dentinal hypersensitivity are also effective in partially occluding the dentinal tubules
- Greenhill and Pashley found potassium nitrate to be ineffective in occluding the tubules, but it is effective as a desensitizing agent.
- Most in-office procedures are aimed at obturating the tubules

Management of hypersensitivity

- Mechanisms of actions of desensitizing agents.

1. Blocking fluid movement by occluding dentinal tubules.
2. Coagulating or precipitating tubular fluids
3. Stimulating the formation of secondary dentin
4. Blocking pulpal nerve activity by attacking the excitability of sensory nerves.

Management of hypersensitivity

- The methods of tubule occlusion are,

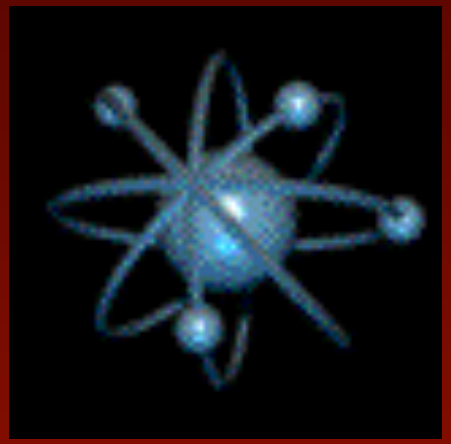
1. Formation of calcium over sensitive tubules
2. Formation of intra tubular crystals from salivary mineral
3. Formation of intra tubular crystals from dentinal fluid.
4. Progressive formation of peritubular dentin
5. Invasion of tubules by bacteria
6. Formation of intratubular collagen plugs

Management of hypersensitivity

7. Formation of irritation dentin
8. leakage of large plasma proteins into tubules.
9. Formation of smear layer by brushing, use of tooth picks etc
10. Resin impregnation or covering
11. Topical application of Calcium hydroxide, sodium fluoride and oxalate
12. Restorations

Selecting desensitizing procedures

- Criteria …. Grossman (1935)
  - ✓ *Provide immediate relief of pain*
  - ✓ *Easy to apply*
  - ✓ *Well tolerated by patients*
  - ✓ *Not injurious to the pulp*
  - ✓ *Will not discolor the tooth*
  - ✓ *Relatively inexpensive.*



Desensitizing agents

- Clinical evaluation is difficult

1. Measuring & comparing pain between different persons is difficult
2. Hypersensitivity disappears by itself
3. Desensitizing agents take a few weeks to act

Instructions to the patients

- Occurs as a result of exposure of dentin
- Disappears over a few weeks
- Plaque control is important
- Desensitizing agents do not produce immediate relief

Desensitizing agents

- Applied by the patients at home
  - ✓ *Dentifrices*
  - ✓ *Approved by ADA… Sensodyne & thermodent… strontium chloride, Denquel & promise…pot nitrate, Protect… sodium citrate.*
- Applied by dentists or hygienists in the dental office.

Office treatments for dentinal hypersensitivity

1. Cavity varnishes
2. Anti inflammatory agents
3. Treatment that partially obturate dentinal tubules
   - ✓ *Burnishing of dentin*
   - ✓ *Silver nitrate*
   - ✓ *Zinc chloride - potassium ferro cyanide*
   - ✓ *Formalin*
   - ✓ *Calcium compounds*
     - ❖ Calcium hydroxide
     - ❖ Dibasic calcium phosphate

Office treatments for dentinal hypersensitivity

- ✓ *Flouride compounds*
  - ❖ Sodium fluoride
  - ❖ Sodium silico fluoride
  - ❖ Stannous fluoride
- ✓ *Iontophoresis*
- ✓ *Strontium chloride*
- ✓ *Potassium oxalate*

4. Restorative resins
5. Dentin bonding agents

Cavity varnishes

- Dentin becomes insensitive
- effective means of providing temporary relief
- Wycoff advocated the use of a cavity varnish such as Copalite
- More sustained relief….. fluoride containing varnish, duraflor

Corticosteroids

- Anti-inflammatory effect of glucocorticoids …. decrease dentinal sensitivity
- Mjor and Furseth ….. application of corticosteroid preparation to dentin caused complete obliteration of tubules
- Mosteller …. liner consisting of 1% prednisolone in combination with 25% parachlorophenol, 25% m-cresyl acetate and 50% gum camphor prevented postoperative thermal sensitivity

Corticosteroids

- Lawson and Huff (1966) found that paramethasone had a significant desensitizing action
- Burnishing an ophthalmic corticosteroid solution into sensitive root area produced some relief

Burnishing of dentin

- Tooth pick or "orange wood stick … creates a partial smear layer on dentin surface
- Reduced fluid movement by 50% to 80%
- More effective in reducing dentin permeability than burnishing with glycerin alone or glycerin in combination with sodium flouride.

Formation of insoluble precipitants

- Calcium oxalate dihydrate
- Calcium fluoride
- Siver nitrate.
- Zinc chloride potassium ferrocyanide impregnation
- Formalin

Silver nitrate

- Powerful protein precipitant
- Precipitated in solution with formalin or eugenol
- Greenhill and Pashley found that the silver nitrate either alone or in combination with formalin ppted silver chloride or elemental silver
- It may cause pulpal inflammation in shallow cavities.
- Naylor & Anderson…. No sig diff

Calcium hydroxide

- It may block dentinal tubules or promote peritubular dentin formation
- Brannstrom (1976) … construction of the dentinal tubules… depth of 0.1mm
- Mjor (1967)…micro radiography… increased radio density
- Following periodontal surgery, Jorkjend and Tronstad applied a creamy paste of calcium hydroxide to the exposed root surfaces and then covered …. periodontal pack

Dibasic calcium phosphate

- Hott and Johansen studied the effectiveness of burnishing $CaHPO_4$
- Significant relief of discomfort

Fluoride

- Burnishing the affected sites with fluoride containing medicaments
- First proposed …. Lukomsky (1941)
- Bolden and Hezen et al have indicated that sodium monofluorophosphate dentifrice…. Effective
- Ranouse and Ash….. 0.76% of sodium monofluorophosphate

Fluoride

- Mechanism of action….
  - ✓ *increasing the amount of reparative dentin, or*
  - ✓ *by precipitating calcium fluoride in the tubules*
- Clement and Hoyt and Bibby (using 33.3 % NaF) found sodium fluoride very effective in reducing dentinal hypersensitivity
- It may produce severe pulpal inflammation when applied to dentin.

Acidulated sodium fluoride

- Laufer et al ……Concentration of fluoride in dentin … greater
- No difference after samples were washed with synthetic saliva
- A small fraction of the fluoride initially deposited on the root surfaces was retained in the insoluble apatitic form.

Sodium silico fluoride

- Bhatia …. saturated solution of sodium silico fluoride for 5min was much potent than 2% solution of NaF in desensitizing painful cervical areas of teeth.
- Everett et al…. that silicic acid forms a gel with the calcium of the tooth, thus producing an insulating barrier

Stannous fluoride

- Blank and Charbeneau advocated burnishing a 10% solution of stannous fluoride
- Topical application of 0.717% aqueous SnF2 provided immediate relief from sensitivity
- Ellingsen and Rolla examined SnF2 treated dentin surface using S.E.M. and observed a dense layer of tin and fluoride containing globular particles blocking the dentinal tubules.
- Blank and associates…0.4% SnF2 gel effective

Fluoride Iontophoresis

- Scott (1962) …..
- Iontophoresis … a method of facilitating the transfer of ions by means of an electrical potential into soft or hard tissues of the body for therapeutic purpose.
- Iontophoresis of fluoride … controversial

Fluoride Iontophoresis - Mechanisms

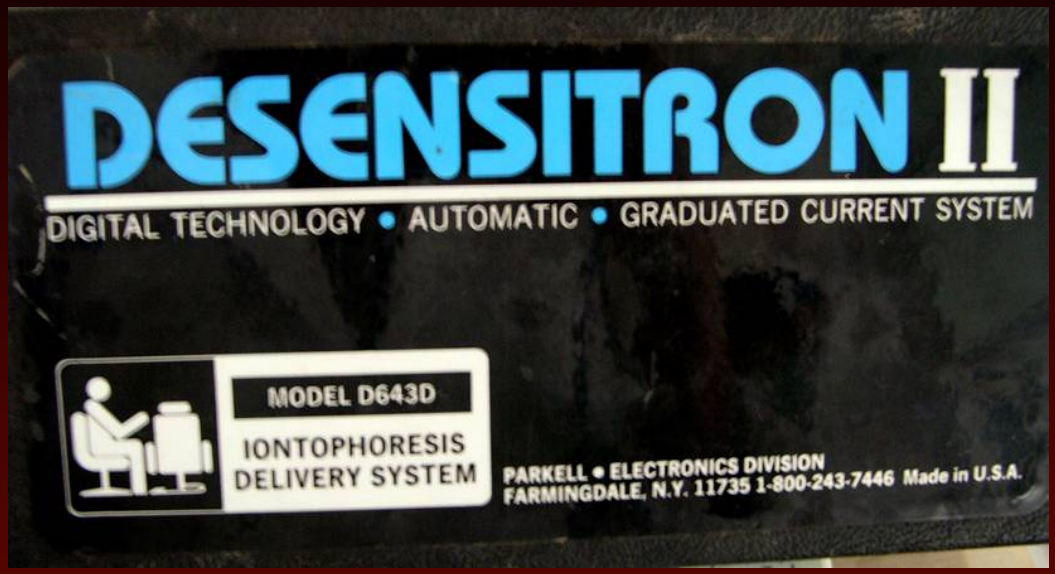
- Induction of Secondary dentin formation by iontophoresis …. Murthy et al
  - ✓ *Lefkowitz et al reported on the pulpal response to 1% sodium fluoride iontophoresis*
- Induction of parasthesia on odontoblast process by iontophoresis …Gangarosa and Park (1978)
  - ✓ *produce parasthesia by a direct effect on the odontoblastic process or by alteration of the sensory mechanism of pain conduction*
  - ✓ *Gangarosa et al… changes in nerve conduction were temporary*

Fluoride Iontophoresis

- Increased fluoride ion concentration and depth of ion penetration into dentin induced by iontophoresis
  - ✓ *Based on hydrodynamic theory*
  - ✓ *micro precipitation of calcium fluoride which served to occlude the tubules*
- Gangarosa recommends that teeth be isolated with plastic strips and cotton rolls rather than a rubber dam

Fluoride Iontophoresis

- Iontophoretic application of fluoride by tray technique
- Three improvements
  - ✓ *a safer, more powerful Voltage source providing upto 40 Volts*
  - ✓ *insulation of gingival tissues and metal restorations and*
  - ✓ *a flexible electrode system adaptable to all areas of the mouth*


DESENSITRON II
DIGITAL TECHNOLOGY • AUTOMATIC • GRADUATED CURRENT SYSTEM
MODEL D643D
IONTOPHORESIS
DELIVERY SYSTEM
PARKELL • ELECTRONICS DIVISION
FARMINGDALE, N.Y. 11735 1-800-243-7446 Made in U.S.A.

Nd-YAG Laser treatment

- Effective in reducing dentine hypersensitivity to cold stimuli.
- The mechanism of action has yet to be confirmed
- Lier et al 2002…Nd:YAG laser…not significant
- Shwartz et al 2002… Er:YAG laser…. Dentin Protector (polyurethane isocyanate)….

Oxalates

- used popularly as desensitizing agent
- inexpensive
- easy to apply and
- well tolerated by the patients
- Potassium oxalate and ferric oxalate solutions
- calcium ions in the dentinal fluid to form insoluble calcium oxalate crystals

Application of potassium oxalate

Resins and Adhesives

- Brannstrom and Nordenvall ….. impregnating it with resin (the unfilled dentin bonding agent)
- produce little adverse pulpal inflammation
- Brannstrom et al obtained “immediate and lasting blockage of sensibility”
- Bowen & Cobb … composite resin bonded to dentin decreased dentin permeability.
- Pashley… contamination with blood & saliva lowers the bond strength of composite

Resins and Adhesives

- Javid & co workers… 6 week study …. Isobutyl cyanoacrylate with 33% of NaF paste….
- Immediate desensitization..
- Sensitivity slowly returned

- Wycoff used adhesives in severe cases
- Glass ionomer cement…. Hydrophilic

- GLUMA…dentin bonding system …includes 5% glutaraldehyde primer & 35 % HEMA

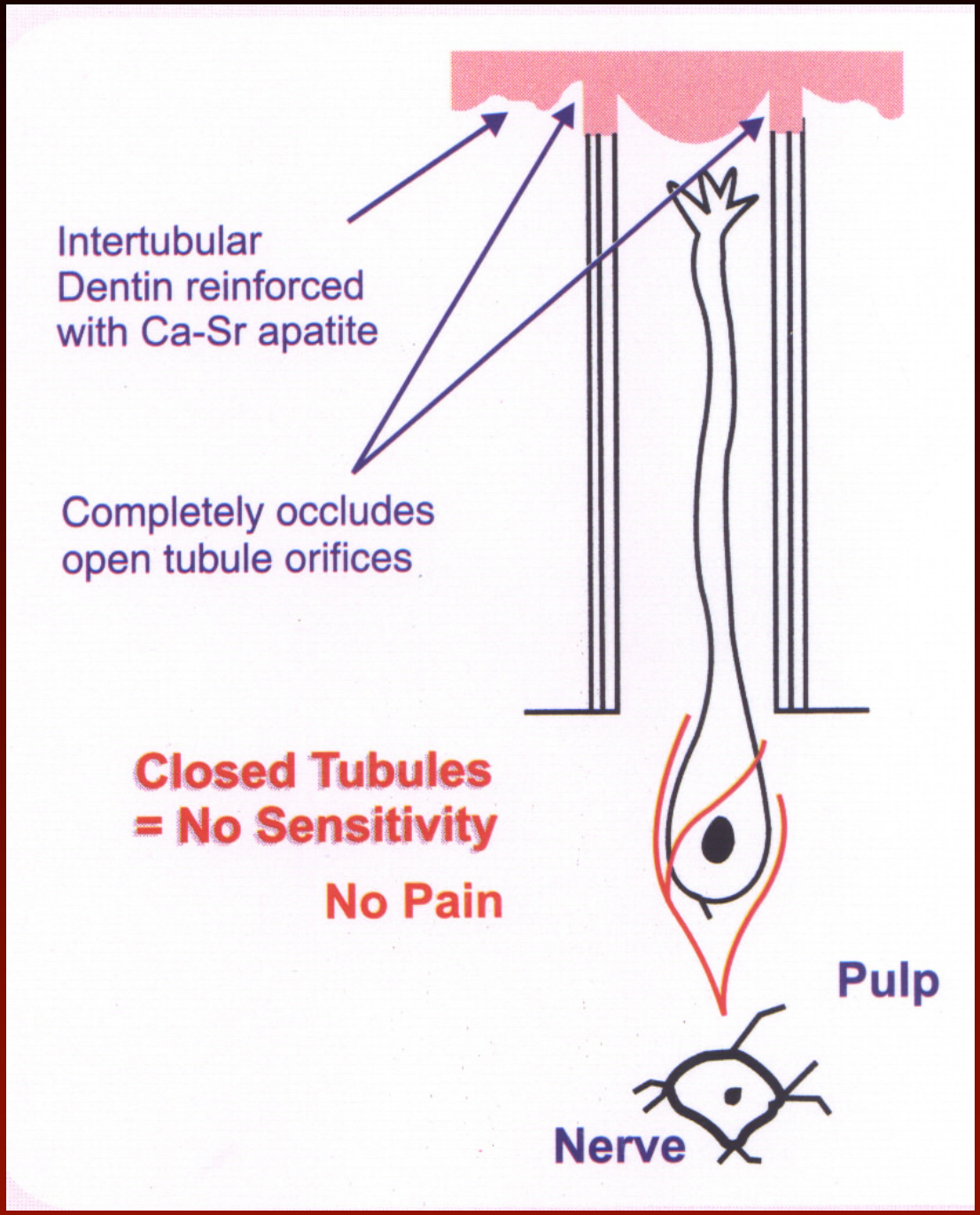
Resins and Adhesives

- Provides an attachment to dentin that is immediate & strong.
- Found to be effective when other methods fail
- Felton & coworkers…. It prevents bacterial growth
- Idle et al 1998…. Dentin bonding agent…. Effective.

Home used desensitizing agents

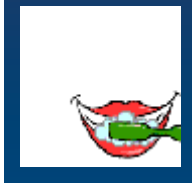
Strontium chloride

- Dentifrice containing 10% strontium chloride hexahydrate as the desensitizing agent
- Sensodyne tooth paste was formulated with strontium chloride hexahydrate in 1961
- Kun…. topical application of concentrated strontium chloride solution
- penetrated the dentin to a depth of about 20 microns and extended into dentinal tubules


Intertubular
Dentin reinforced
with Ca-Sr apatite
Completely occludes
open tubule orifices
Closed Tubules
= No Sensitivity
No Pain
Pulp
Nerve

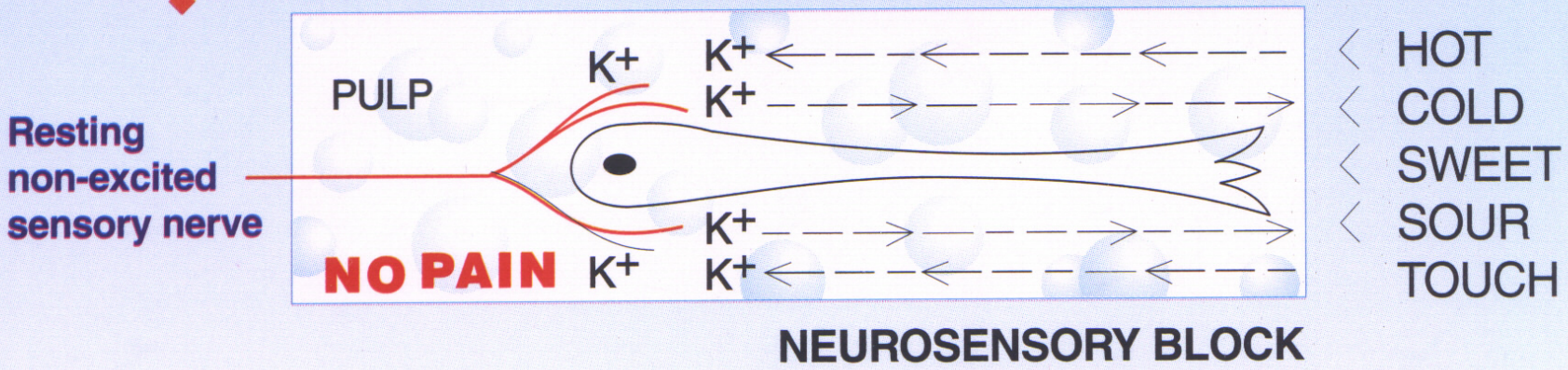
Potassium Nitrate

- Greenhill and Pashley found potassium nitrate ineffective in decreasing any dentinal fluid flow
- 5 % potassium nitrate an excellent desensitizing agent
- Green et al compared potassium nitrate to calcium hydroxide in the desensitization from mechanical, hot and cold stimuli
- Hodash (1974) called potassium nitrate a superior desensitizer and found it to be highly effective at concentrations of 1 to 15 %



On Application

Levels of K^+ Prevent the Excitation of Nerve Endings in Pulp



NEUROSENSORY BLOCK

Potassium Nitrate

- Tarbet et al found 5 % potassium nitrate able to desensitize the dentin effectively at 1 week and 4 weeks compared to control
- Frecoso S et al 2002… potassium nitrate bioadhesive gels.. 5 % & 10%.

Fluoride dentifrice

- Sodium monofluorophosphate …..
- Found to be effective

Dibasic sodium citrate

- Dibasic sodium citrate formulated into a pluronic P-124, containing dentifrice is the final ingredient currently recognised by the ADA as being safe and effective for the treatment of dentinal hypersensitivity.

Formaldehyde

- Formalin is an agent … control of dentin hypersensitivity
- During late 1940s, Emoform tooth paste was introduced. It contains 1.4% formaldehyde, 14% calcium carbonate, 15% Magnesium carbonate and a mineralizing salt mixture of sodium bicarbonate 3.4%, sodium chloride 1.45%, potassium sulphate 0.0075% and sodium sulphate 0.0075%.
- The studies reported considerable reduction in dental hypersensitivity.

Studies

- Addy et al 1997…. Strontium & potassium based toothpastes with fluoride & a fluoride toothpaste…..
- Srinivas et al 1997 ….. Gluma primer & 10% potassium nitrate….
- Schiff et al 1998…. 5% pot nitrate & 1500 ppm sodium monofluorophosphate….
- Pereira et al 2001… 3% pot nitrate/0.2 % sodium fluoride mouthwash with a 0.2% sodiumfluoride mouthwash.

Summary & Conclusion

References

- DCNA on Tooth hypersensitivity 1990, 34:3
- Text book of clinical periodontology – Newman Carranza
- Clincal periodontology & oral implantology – Jan Lindhe
- Text book of conservative dentistry – Sturdevent
- Dentinal sensation & hypersensitivity – A review of mechanisms & treatment alternatives – JP 1984
- Role of dentin bonding agent in reducing cervical dentin hypersensitivity – JCP 1998

References

- JCP 2002 “desensitizing effects of an Er:YAG laser on hypersensitive dentin”
- Jisp 1997… comparitive evaluation of Gluma primer & 10% pot nitrate in treating cervical dentin hypersensitivity.
- JCP 2002.. Treatment of dentin hypersensitivity by Nd:YAG laser
- JP 2001…. Efficacy of 3% pot nitrate desensitizing mouthwash in the treatment of dentin hypersensitivity.
- JCP 1997…


Thank You