Restoring the Primary molar: a workshop

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Goals

- 1. Understand treatment options for the inflamed pulp in primary teeth
- 2. Practice pulpotomy techniques using MTA (Biodentine by Septodont), Glass ionomers (Fuji II LC by GCAmerica)
- 3. Restore the primary pulpotomized tooth with composite (Gradia by Fuji.
- 4. Prepare and restore a tooth for a stainless steel crown (Hu-Friedy)

Thanks to the Workshop Supporters

- Hu-Friedy
  - SSC
  - Instruments
- GC America/ Fuji
  - Composites
  - Glass Ionomers
  - Ortho cement
  - Instruments
  - Curing lights
  - Triturators
- Septodont
  - Biodentine
  - Racedent gel
- Kilgore
  - Typodonts
- BienAir
  - Electric Handpieces

Three Rules #1

• The pulp chamber in primary teeth is always in the middle of the occlusal surface

Three Rules #2

• You fit the tooth to the crown not the crown to fit the tooth

Three Rules #3

• Typodont teeth are not real teeth and don't cut the same

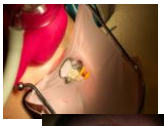
• Gentle, gentle, gentle

And a few more!

- Pain control!
- Rubber dam a must in kids!

Use a rubber dam for all restorations

- Nothing worse than fighting lips, tongue, cheek in a gagging child
- Protects against aspiration
- 2 hole slit stretched over quadrant
- 2A, 8A, 00,14A
- Wedges
- Or use isolation device
  - Mr. Thirsty
  - Isolite
  - Optralite



Pain Control in Children

- Necessary for successful treatment
- Poor pain control often misinterpreted for disruptive behavior
- Requires special understanding of physiology and psychology of children

Use topical and make it red

- Ester anesthetic
- Hides the color of blood
- Numbs mucosa but not much deeper
- Still requires distraction and clenching
- Optimum time 1-3 minutes
- Don't use too much
  - Risk of methemoglobinemeia

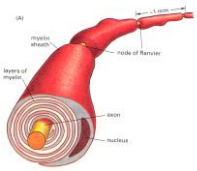
Don't waste your money on expensive anesthetics

- 2% Lidocaine with 1:100000
  - Wide margin of safety
  - Full mouth with two carpules
  - Lasts too long?
  - Amide anesthetic
    - Metabolized in the liver
  - High pKa therefore slower dissociation to free base
    - Infection has lower pH: limits free base

Don't block children under 8 or use a full carpule

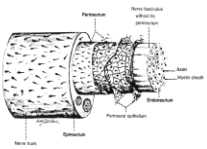
- Porous bone
- Teeth clenched
- Move needle along alveolar bone
- Interdental
- Never do a "long buccal"
- 1 hour anesthesia time
- Controlled by volume

Peripheral Sensory Nerve Conduction



Anesthetic solution must cover 3 nodes (≅ 3 mm) to block nerve impulse.

Protein bound section active here blocking Na^{+} channels.



Commonly Used Local Anesthetic Agents - Dose Recommendations from AAP/AAPD

Drug	Maximum dose with epinephrine (mg/kg)	
	Medical Use	**Dental Use**
Lidocaine	**7.0**	**4.4**
Mepivacaine	**7.0**	**4.4**

▪**Determined by relative vascularity of injection area**

Guideline for Monitoring and Managing Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures. AAPD Reference Manual 2006-2007

Moore's Rule of 25

- One cartridge/25 lbs(11 kg) body weight
- Any marketed local anesthetic used in dentistry
- Establishes a conservative dose
- Examples:
  - 50 lbs.(22 kg) 2 carpules
  - 75 lbs. (33 kg) 3 carpules
  - 100 lbs. (44 kg) 4 carpules
- May be too conservative in preschool child
  - More accurately 1 carpule/22 lbs (10 kg)
- mg/kg calculation provides greater accuracy

▪Moore P., Manual of Local Anesthesia. 4th ed. Eastman-Kodak Co., Rochester, NY, 1996

Local Anesthetic Volume Administered

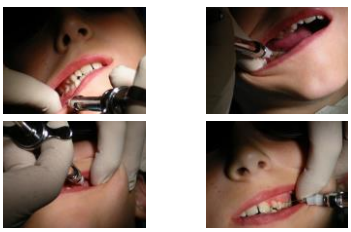
"For children under 10 years of age, it is rarely necessary to administer more than one-half cartridge (20 mg), even for mandibular blocks."

Astra Pharmaceuticals Package Insert, 1997

Anesthesia Techniques in Children

- Short needle
- Smaller amount
  - Diffuses over a larger *relative* area
  - Less mylenization
- As few teeth and soft tissue areas affected as possible!

Infiltration Technique

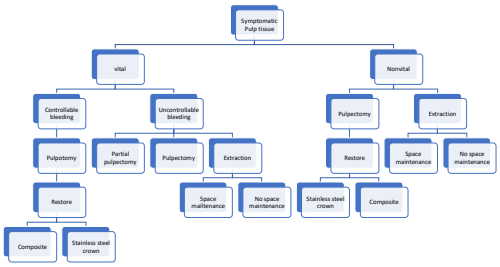


Use a mouth prop

- The always useful mouth pillow!
- Helps the child relax
- Prevents unwanted "Code Red"
- Passive placement, not forced

Pulp Therapy

Pulp Therapy Primary Tooth



Primary Tooth Pulp Therapy

- Caries Control
- Pulpotomy
- Partial Pulpectomy
- Pulpectomy
- Extraction

Primary Tooth Pulp Therapy

- Caries Control
  - Active decay
  - Elicited pain
  - Absence of soft tissue findings
  - Absence of radiographic findings
  - Absence of mobility

Primary Tooth Pulp Therapy

- Caries Control/ Indirect Pulp Cap
  - Partial removal of decay
  - Palliative and hydroscopic material
  - ZOE
  - $Ca(OH)_2$
    - Light cured Theracal
  - IRM
  - Glass Ionomers
  - Return for definitive pulp therapy and restoration (sometimes! Not always)
- Direct Pulp Cap
  - Rarely effective

Primary Tooth Pulp Therapy

- Pulpotomy
  - Active decay
  - Elicited or spontaneous pain
  - Absence of soft tissue findings
  - Absence of radiographic findings
  - Absence of mobility
  - Controllably hemorrhagic pulp
  - Infected coronal pulp

Vitapex

- One word for successful pulpotomies and pulpectomies
- Calcium hydroxide
- Silicone oil*
- Iodophor paste
- Wonder drug?
  - Are the results clinically better?
    - Mortazavi,M, Mesbahi, M. Comparison of zinc oxide and eugenol, and Vitapex for root canal treatment of necrotic primary teeth. Int J Paediatr Dent: 2004 Nov;14(6):417-24.

Mineral Trioxide Aggregate

- MTA is a cement composed of tricalcium silicate, dicalcium silicate, tricalcium aluminate, tetracalcium aluminoferrite, calcium sulfate and bismuth oxide (modify setting properties)
- Alkaline similar to calcium hydroxide explaining properties
- Mix powder with sterile water and pack into area with condenser or tool. Area should be moist to aid setting
- 4 hour set
- Use under SSC or GI then cover with composite
- Strength equal to IRM, seals better than amalgam
- Histologically induces dentinogenesis and cementogenesis with little inflammatory response
- Nonresorbable
- Expensive as a dental material, cheap as Portland cement

Two Basic Formulations

- ProRoot by Dentsply Tulsa
  - MTA
    - Very strong
    - Discoloration of tooth

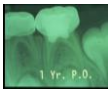
- Biodentine by Septodont
  - Tricalcium Silicate salt
    - Strong and ½ hour set noncompressible
    - Study shows composite directly over does not flex to breaking point when applied 10-30 minutes after placement

Achieving Hemostasis

- Slightly moist cotton pellet and pressure
- Cotton pellet dipped in fibrin
- Electrosurgery/electrofulgeration
- Cotton pellet dipped in astringent
  - Ferric sulfate
    - Astringodent
  - Ferric chloride
  - Aluminum chloride
    - Hemodent
- Gels
  - Aluminum chloride
    - Racedent thermogel (Septodont)
    - Traxodent (premier)
      - Absorbs moisture and constricts vessels

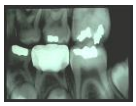
Primary Tooth Pulp Therapy

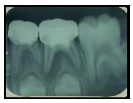
- Pulpotomy
  - Remove ALL decay
  - Remove roof of pulp chamber
  - Extirpate coronal pulp
  - Achieve hemostasis
    - Cotton pellets
    - $Fe_2(SO_4)_3$ / $AlCl_3$/ astringent
    - Laser/electrosurgery
  - ZOE(IRM)/Vitapex dressing/ GI cover if bonded restoration
  - MTA!! (no formo/ +/- $FeSO_4$)/ GI cover if bonded
  - Full coverage restoration/bonded restoration



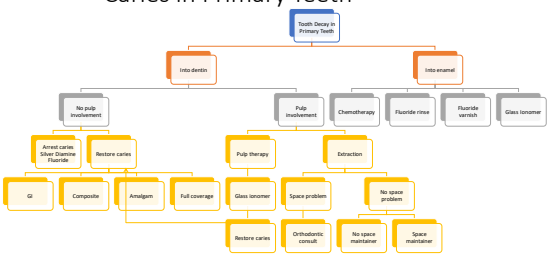
Primary Tooth Pulp Therapy

- Why pulpotomies fail…
  - Define FAILURE!
  - Failure to remove entire roof of pulp chamber
  - Failure to remove all coronal pulp and pulp tags
  - Failure to achieve hemostasis
  - Failure in diagnosis
    - necrotic pulp
    - infected and hemorrhagic pulp
  - Failure to maintain clean field/ place appropriate nonleaking restoration



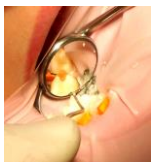


Caries in Primary Teeth



Don't extend for prevention

- G.V. Black had it all wrong!
- Small bonded restorations that preserve tooth structure
- Seal all vulnerable grooves
- Composite v. GI v RMGI
  - Wear resistance and acid dissolution
  - May need to cover GI and RMGI with composite

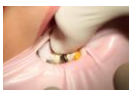


Use Metal Matrices

- Not plastic
  - Will have uncured layer of resin next to the band

Spot weld your matrices

- For back to back preps
- Use metal strips, not plastic



Use two curing lights

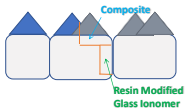
- Faster/Faster/Faster!
- More light & multiple cure directions
  - Material draws up to light direction
- Still the most reliable at 40sec.
- Always use large tip
- Must get 70% cure rate for maximum strength
- Or just buy a brighter light…
  - Does not lead to increased shrinkage
  - Cure in 5-9 seconds
  - Always check for compatibility with materials
  - Watch angulation
    - Shrinks towards light
  - >1200 lumens
  - Check material compatability

Other Composite Op Tips!

- Place a flowable material in the proximal box and then pack your composite into it: allows better adaptation and a little more resiliency at the margins
- Use a burnisher (not a plugger) to place and smooth composites
- Opaque/whiter materials need more light
  - Bulk fill composites cure more thoroughly but most wear more rapidly
  - 10-30 seconds and perpendicular!
- Trim using 12 fluted carbide flame and barrel shaped burrs and a gingival trimmer
- When restoring a pulpotomized tooth, separate eugenol or silicone based materials from the composite by placing a layer of glass ionomer
- No advise on the bruxer/GERD child!
  - The teeth flex and the composite is stiff
  - GI will give but also erode

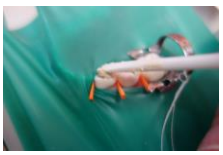
Posterior Sandwich Restorations in Primary Teeth

- Sandwich Preparation
  - Fluoride releasing G.I. next to incipient lesion covered by wear resistant composite
  - Appropriate on proximal lesions in primary teeth
  - Extremely appropriate on distal lesions on 2nd primary molars abuting a permanent molar



Stainless Steel Crowns v. Composite

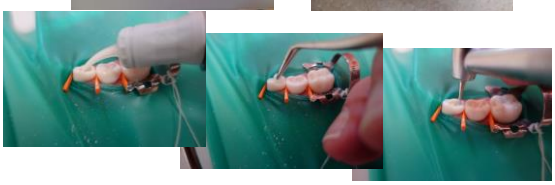

Bloxanline




30
Amalgamator


ESPE

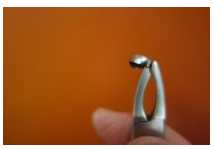

10
Amalgamator



Stainless Steel Crowns

And finally, if you can't get a crown to fit…

- Turn the belling pliers backwards and reverse bell!



Oh No! Where'd the Space Go?

Space management in children workshop

DAVID L. ROTHMAN, D.D.S.
PEDIATRIC DENTISTRY

1

Purpose of the Primary Dentition

- Speech
- Mastication
- Esthetics
- Prevention of Oral Habits (tongue thrust)
- Guiding the Erupting Permanent Teeth
- Maintain Arch Integrity and Arch Length

2

Disruption of Dental Arch in Primary Dentition

- Reduction of arch length
- Blocked or deflected eruption of permanent teeth
- Supereruption of opposing dentition
- Interferences in occlusion
- Unattractive appearance
- Food impaction
- Increased caries and periodontal disease

3

Purpose of Space Management

- Maintain mesiodistal relationship
- Prevent space loss
- Prevent ectopic eruption
- Reduce need for further orthodontic management

4

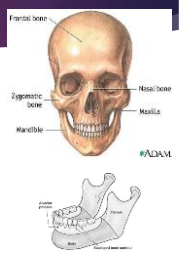
Prevention is Key to Success and Health

- Diet and Caries
- Frequency of eating
- Oral hygiene and removal of biofilm
  - Brushing
  - Flossing
- Fluoride use
  - At least BID for tp
  - Continuous for tap H2O
- Sugar Alcohols
- Frequent dental visits
  - Why twice per year

5

All Bone is not the Same!

- Skeletal or basal bone
  - Intramembraneous or Endochondral
  - Thick cortical plate
  - Vascular with marrow spaces
  - Unyielding
- Alveolar bone
  - Develops embryologically with cementum
  - Exists only for the teeth
  - Porous
  - Allows orthodontic movement through rapid remodeling
    - ARF cycle



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Mechanisms of Tooth Eruption

- Root Formation
  - Hertwig's epithelial root sheath and basement membrane
- Bone Remodeling
  - Moves teeth through growth and selective resorption and deposition
  - ARF cycle
- Dental Follicle
  - Cascade of intracellular signals that recruit osteoclasts and decrease blood supply
- PDL
  - Stem cells
- Molecular determinants of tooth eruption
  - Balance between destruction and depositionof bone

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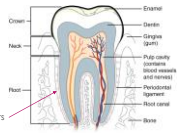
Eruption of Permanent Teeth

- May not all be necessary
- Process
  - Primary tooth resorbs
  - Root of permanent tooth lengthens
  - Permanent tooth develops path and moves through bone
  - Alveolar process increases in height
    - Alveolar bone is directly connected to dentin through von Korff's fibers
- Stages
  - Pre-Emergent <2/3 root- in bone
  - Post Emergent >2/3 root- out of bone



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Factors that Influence Space Loss

- Abnormal Musculature and imbalance
- Oral Habits
- Existing malocclusion and genetic factors
- Stages of occlusal development
  - Increased space loss if teeth are actively erupting adjacent to space left by early tooth loss

9

Factors Reviewed Before Space Management

- Time elapsed since loss
  - Space maintenance sooner the better
- Dental age of patient
  - Which teeth have erupted-perm v prim
  - Development of permanent tooth
  - Root resorption of tooth being lost
- Amount of bone overlying unerupted tooth
  - Abscess and bone damage
  - Early eruption of perm tooth without 2/3 root development
- Sequence of eruption of permanent teeth
- Delayed development leading to delayed eruption and impaction of perm tooth
- Congenital absence of permanent tooth and orthodontic consultation with ridge preservation
- Growth pattern of the jaws: horizontal v vertical

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Space Loss by Arch

- Maxillary
  - Forward bodily movement
  - Mesial crown tipping
  - Mesiolingual rotation around the palatal root
- Mandibular
  - Mesial crown tipping of teeth posterior to loss
  - Distal movement and retroclination of teeth anterior to space
  - No bodily movement
  - Greatly enhanced in vertical growers

11

When Do You Need Space Management?

- Anterors after cuspid eruption
  - No
  - Cosmetics with Groper appliance for maxillary arch
- Cuspids
  - Yes
  - To prevent midline deviation and space loss with lower incisors moving laterally into space
- Primary 1st molar
  - Mandibular
    - Yes
    - Unilateral or bilateral
  - Maxillary
    - Yes/no depending on whether 1st permanent molar present because of rotational space closure
    - Unilateral or bilateral
- Primary 2nd molar
  - Mandibular
    - 1st perm molar present- yes
    - 1st perm molar not present – modified distal shoe appliance
  - Maxillary
    - Yes - to prevent mesial tipping and rotation of 1st perm molar

12

Characteristics of the Ideal Space Maintainer

- Prevent movement of teeth from anterior and posterior directions
- Not interfere with normal growth and development
- Simple to construct and maintain
- Durable, strong, stable and adaptable
- Passive placement except in space regaining
  - Halterman appliance and spring appliance
- Cleansible and adjustable

13

DANGER WILL ROBINSON*

- No sticky foods
  - Gum is usually OK
- Hard crunchy foods on the other side
- The child will likely dislodge one time within first month
  - Tell child to tell parents and gently remove before chewing on it
- May cause eruption and growth and development problems
- May increase caries and food retention therefore optimum OH

* Obscure reference to old TV show, "Lost in Space"

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Types of Space Maintainers

- Fixed and Cemented
  - Band and loop and modified distal shoe
    - Unilateral space loss
    - Max and mand
    - One or two teeth
    - Allows eruption of permanent teeth
  - Lingual arch
    - Allows eruption of permanent teeth
    - Mandibular
    - May restrict buccal growth

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Types of Space Maintainers

- Nance Holding Arch
  - Maxillary
  - Bilateral with unilateral or bilateral space loss
  - Acrylic palatal button to prevent mesial migration
  - Prevents buccal expansion and single tooth eruption
- Transpalatal Arch
  - Maxillary
  - Bilateral with unilateral or bilateral space loss
  - Placed between most distally erupted teeth
  - Prevents buccal expansion and single tooth eruption

Wilson 3-D

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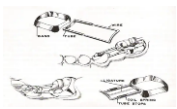
Types of Space Maintainers

- Chairside v Lab Processed
  - Time to placement
  - Cost
  - Flexibility
  - Customization
  - Tooth eruption
  - Impressons- accurate?
  - Hemostasis
  - Fit to gingiva
  - Erupting tooth?
- Chairside
  - Gerber
  - Wilson 3D



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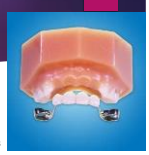
Types of Space Maintainers

- Cosmetic
  - Groper Appliance
    - Can also function as space maintainer
    - Hint: place composite on linguals of cuspids to decrease torque on bands



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Types of Space Maintainers

- Removable
  - Require stability and therefore bulk and retention
  - Can be aspirated if poorly fit
  - Easily customizable for space regaining
  - Unilateral/Bilateral

Space regaining appliance

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Comparison of Fixed v Removable

Fixed Appliances	Advantages	Disadvantages
	Minimal patient cooperation to keep in mouth	Does not restore occlusal function
	More difficult to break or dislodge	Difficult to clean
	Manufactured chairside with fewer adjustments	Difficult to adjust after inserted
	May be placed immediately after extraction	

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Comparison of Fixed v Removable

Removable Appliances	Advantages	Disadvantages
	Easily cleaned	Requires patient cooperation
	Easily adjusted	Soft tissue irritation
	Easily constructed usually by lab	Easily broken or lost
	Easily repaired	Requires impression and multiple visits
	Maintains occlusion	Plaque trap

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Procedures for Today #1 Band Fitting and Impression

- Fit bands on maxillary 6s
- Take impression
- Remove bands
- Position in impression

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Procedures for Today #2 Gerber Band and Loop

- Unscrew S and put aside
- Fit Gerber Band for single tooth space loss on T
- Measure space distance between T and R
- Cut Gerber loop to correct length
- Fit and adjust loop and secure to Gerber band
- Cement (pretend)
- Repeat returning S and now removing T
  - If 6 not fully erupted what would you do?

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Procedures for Today #3 Space regaining appliance

- Remove T
- Fit Gerber Band to 6
- Project space loss of 2mm
- Cut loop and with 3 prong plier tip up contact end
- Fit and cut coil spring
- Adjust gerber male fittigs so they are parallel and allow free movement
- Slide loop into tube and secure with floss
- Cement (pretend
- Remove floss

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Procedures for Today
#4 Extended Gerber Band and Loop

- Remove teeth S and T
- Fit Gerber Band for single tooth space loss
- Measure space distance between first permanent molar and cuspid
- Bend .030 stainless steel wire from distal of cuspid
- Cut wire to correct length
- Fit and adjust loop and secure to Gerber band
- Cement (pretend)

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Procedures for Today
#5 Distal Shoe and Modified Distal Shoe

- Replace all teeth and remove 6
- Fit band on T pointing distally
- Measure distance to the distal of 6 socket
- Cut and insert distal shoe
- Xray for length
- Remove distal shoe and cut off and polish cover with composite resin or acrylic
- Replace with loop applying downward pressure

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Procedures for Today
#6 Lower Lingual Holding Arch

- Fit bands with vertical slots bilaterally
- Bend appropriate sized wire to rest on the cingulum of the mandibular incisors and adjust omega loop for custom fit
- Reduce buccal forces by having arch sit passively between loops
- Insert wire in slots and secure with ligature tie or composite or acrylic if needed. May make difficult for later adjustment
- This may also be sent to lab for fabrication after impression with bands in place
- Procedure is same for maxillary appliance (TPA and Nance) and also for Groper appliance (tip: GI button on back of cuspids where wire touches)

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Space Management Workshop

- Thanks for coming today
- Contact me at
  - drdavid@davidlrothmandds.com

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