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DISCLOSURE STATEMENT

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Disclosure statement: The study was supported by Procter & Gamble.



RECOMMENDED BOOKS- PEDIATRIC DENTISTRY

BASICS OF EVIDENCE BASED DENTISTRY

- | | |
|----------------|-----------------------|
| 1. CASAMASSIMO | 6. ENLOW |
| 2. MCDONALD | 7. COHEN'S |
| 3. CAMERON | 8. MALAMED (SEDATION) |
| 4. PROFFIT | 9. GLICKMAN |
| 5. BICHARA | 10. TERRY |

RECOMMENDED JOURNALS- PEDIATRIC DENTISTRY

UPDATE OF EVIDENCE BASED DENTISTRY

- | | |
|---|--|
| 1. Acta Odontologica Scandinavica | 15. Journal of the American Dental Association |
| 2. American Journal of Diseases of Children | 16. Journal of Clinical Orthodontics |
| 3. American Journal of Orthodontics and Dentofacial Orthopedics | 17. Journal of Dental Research |
| 4. Anesthesia Progress | 18. Journal of Dentistry for Children |
| 5. Angle Orthodontist | 19. Journal of Endodontics |
| 6. Caries Research | 20. Journal of Oral Surgery |
| 7. Cleft Palate-Craniofacial Journal | 21. Journal of Periodontology |
| 8. Clinical Pediatric Dentistry | 22. Journal of Prosthetic Dentistry |
| 9. Clinical Preventive Dentistry | 23. Journal of Public Health Dentistry |
| 10. Community Dentistry and Oral Epidemiology | 24. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics |
| 11. Endodontics and Dental Traumatology | 25. Pediatric Dentistry (Journal of the AAPD) |
| 12. European Archives of Paediatric Dentistry | 26. Pediatrics (Journal of the AAP) |
| 13. European Journal of Orthodontics | 27. Special Care in Dentistry |
| 14. International Journal of Paediatric Dentistry | 28. Swedish Dental Journal |

RECOMMENDED GUIDELINES- PEDIATRIC DENTISTRY

PROTOCOLS OF EVIDENCE BASED PEDIATRIC DENTISTRY

1. AAPD
 - INTRODUCTION
 - DEFINITIONS
 - ORAL HEALTH POLICIES
 - CLINICAL GUIDELINES
 - ENDORSEMENTS
 - RESOURCE SECTION
2. DENTALTRAUMAGUIDE.ORG
 - PRIMARY DENTITION
 - PERMANENT DENTITION
3. WWW.IADT-DENTALTRAUMA.ORG/1-9%20%20iadt%20guidelines%20combined%20-%20-%2011-5-2013.pdf
4. AAPD COMPREHENSIVE REVIEW

PEDIATRIC DENTISTRY V.37/NO.2/MAR/APR 15

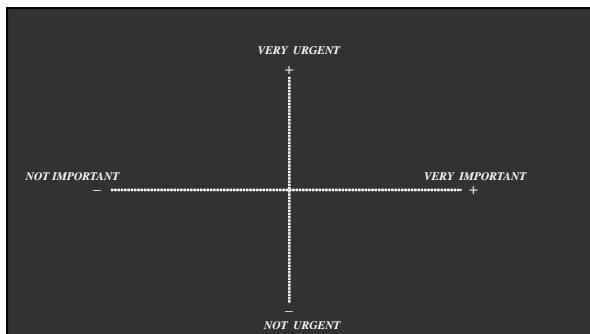
Consensus Statements

The purpose of the Pediatric Dentistry Symposium was to update, based on scientific data, topic areas from the Pediatric Dentistry Consensus Conference, recommending the appropriate dental care for children.

Hierarchy of Evidence (Quality of Research)

Dr. David Sackett

+ Validity
 Meta-analysis
 Systematic Reviews
 Randomized Clinical Control Trials 2B
 Cohort studies
 Case control
 Series of cases/report of cases
 Ideas/editorials/opinions
 Animal research/Invitro
- Validity



Pediatric Dentistry - Dental Management of Frail Adults 2014 - Vol. 28 - No. 10
 Issue Release Date: Wednesday, December 10, 2014

- Be Cautious When Selecting Local Anesthetics for Older Adults.
- Assess Tooth, Patient Carefully Before Treating Caries.
- Consider Potential for Success When Selecting Caries Treatment.
- Heart-Related Issues, Steroid Use -- Delays in Treatment.
- Treatment Must Improve Oral Comfort, Quality of Life.

KANO: CONWAY

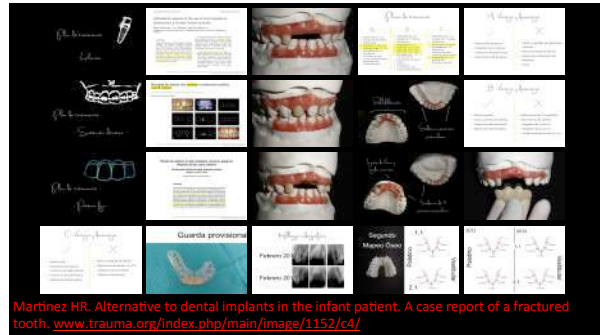
Kano, Moriaki; Nobuhiko Seraku, Fumio Takahashi, Shinichi Tsuji (1984). "Attractive quality and must-be quality". *Journal of the Japanese Society for Quality Control* (14 (2)): 39-45.

COMPETENCIES

- 4 Sealants.
- 2 Patient Comprehensive Examinations.
- 1 Class II in **primary molar**: amalgam or composite.
- 1 SSC in a primary molar.
- 1 Pulpotomy in a primary molar.
- 1 Nitrous sedation.
- 1 Diagnose, treatment plan and/or refer space management.
- 1 Experience with special needs patient.



Martinez HR. Alternative to dental implants in the infant patient. A case report of a fractured tooth. www.trauma.org/index.php/main/image/1152/c4/



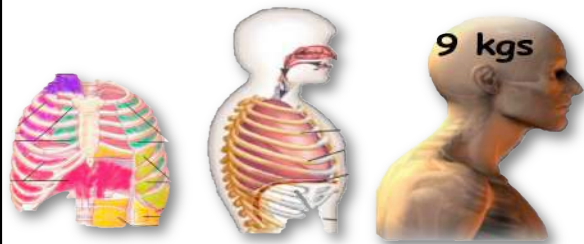
Martinez HR. Alternative to dental implants in the infant patient. A case report of a fractured tooth. www.trauma.org/index.php/main/image/1152/c4/

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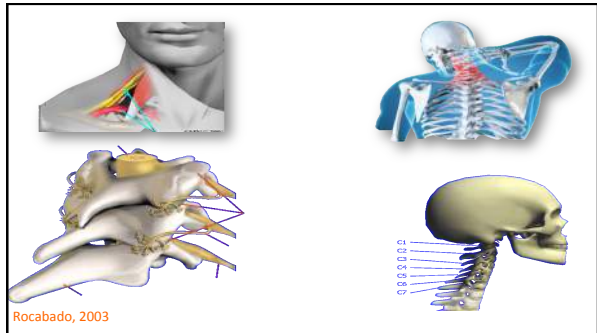
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POSTURE-HEAD FORWARD

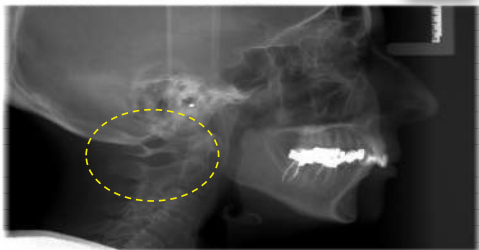


Rocabado, 2003

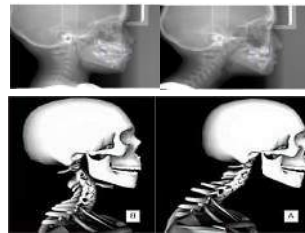


Rocabado, 2003

Normal: 4-9 mm



Rocabado, 2003



Chek, 1988. "Scientific balance training".

MUSCLES



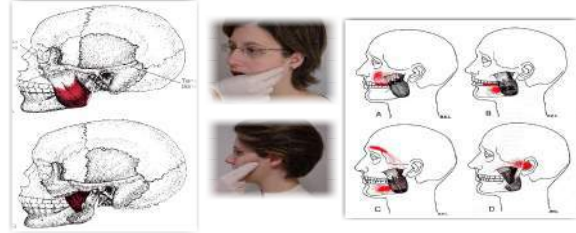
MUSCLES

- Muscles involved in breathing.
- Muscles involved in the masticatory system.
- Muscles of the neck
- Muscles of the back (superior and inferior).

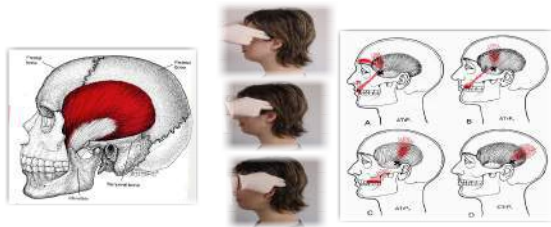
Range of movement-Cervical



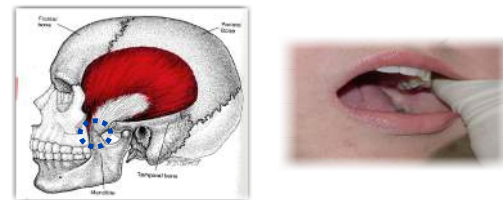
Masseter



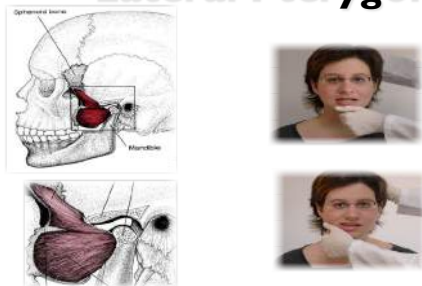
Temporalis



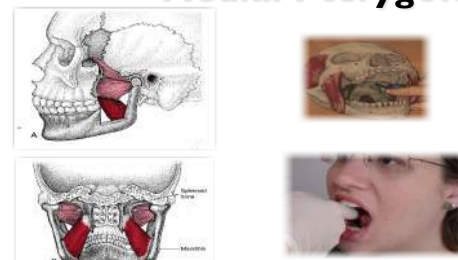
Temporal Tendon



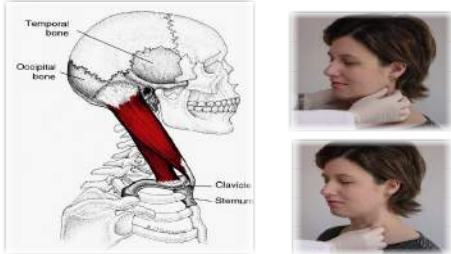
Lateral Pterygoid



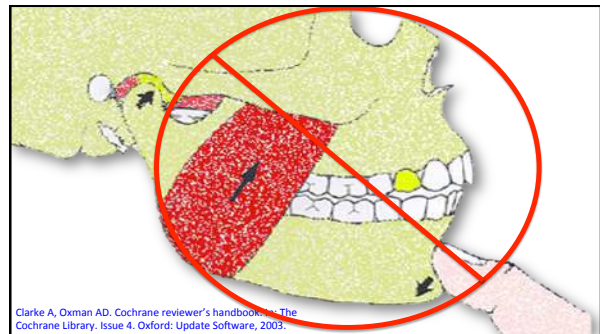
Medial Pterygoid



Sternocleidomastoid



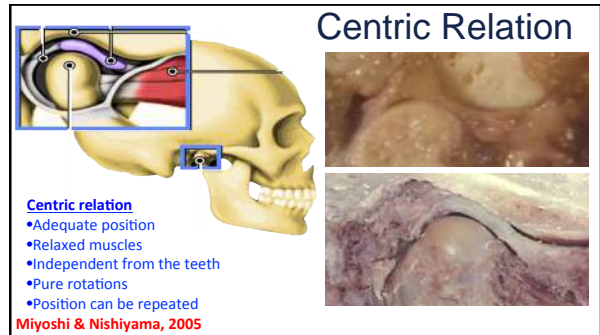
Trapezius

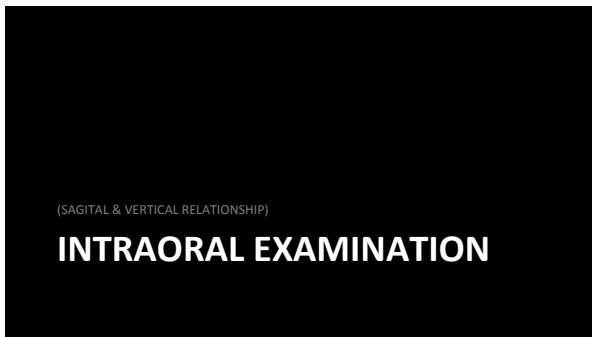
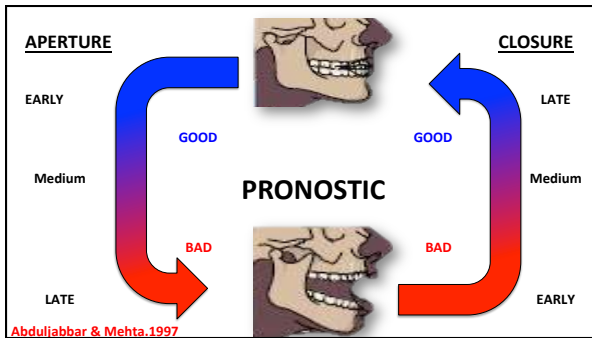
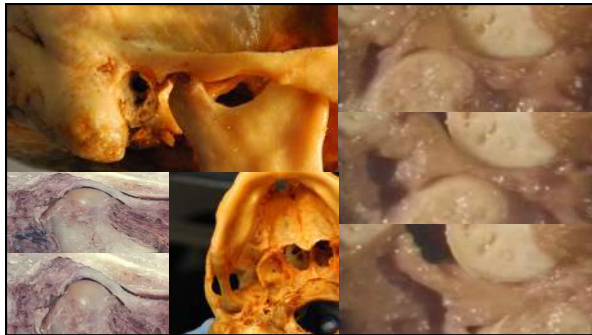


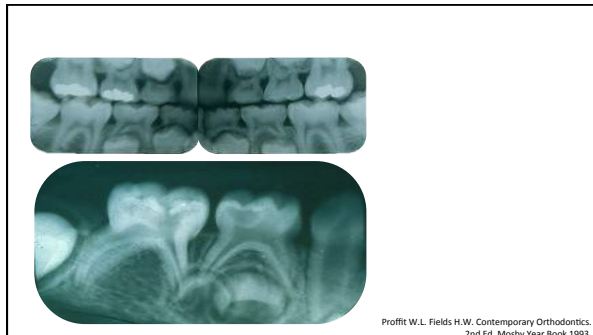
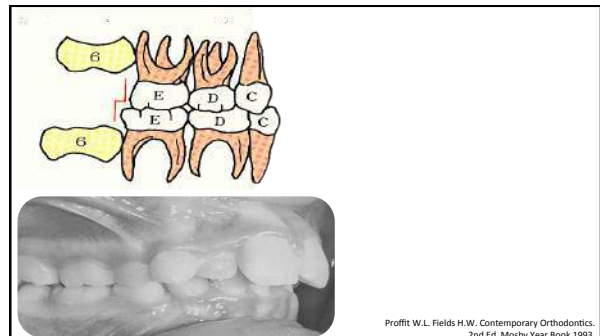
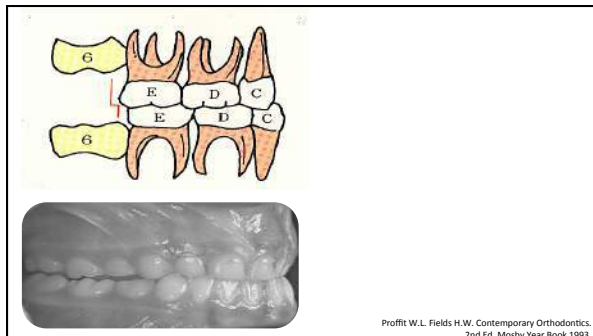
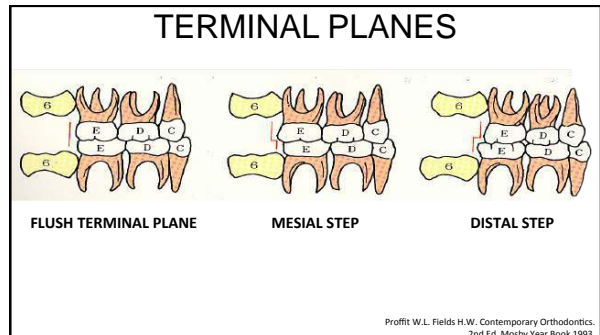
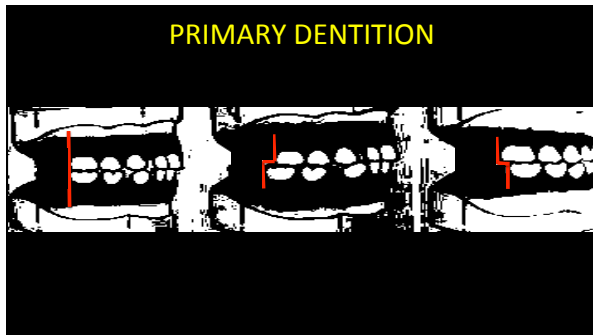
EXTRAORAL EXAM



Centric Relation







Dental Arch/Occlusal Development: From Infant to Adolescent

- 1 Distal step (10%)
- 2 Flush terminal plane (30%)
- 3 Mesial step (60%)

Baume, Physiologic tooth migration and its significance for the development of occlusion. I. The biogenesis of the deciduous dentition. *Journal of Dental Research* 1950 29: 123-132

Baume's 3 factors for Class I adjustment:

1. Mesial growth of mandible.
2. Early mesial shift-closure of generalized posterior spacing with eruption of 1st permanent molars.
3. Late mesial shift-mesial drift of mandibular 1st permanent molars into leeway space.

Dental Arch/Occlusal Development: From Infant to Adolescent

- Class I 61.6 %
- Class II 34.3%
- Class III 4.1%

- Distal Step > Class II
- Flush Terminal plane >
 - 56% class I
 - 44% class II
- Mesial Step >
 - Class I
 - Class II

SE Bishara, BJ Hoppens, JR Jakobsen and FJ Kohout. Changes in the molar relationship between the deciduous and permanent dentitions: a longitudinal study. Journal/ AM J orthod Dentofacial Orthop 1988 93: 1928

Changes in molar relationship between the primary and permanent dentitions...
Bishara, AJODO. 1988

initial occlusion/ 1*	N	First molar occlusion/ 2*		
		Class I	Class II	Class III
Distal step 1 7 mm	23	0	23	0
Flush terminal plane	71	40	31	0
Mesial step 1 mm	101	77	23	1
Mesial step ≥ 2mm	17	32	6	9

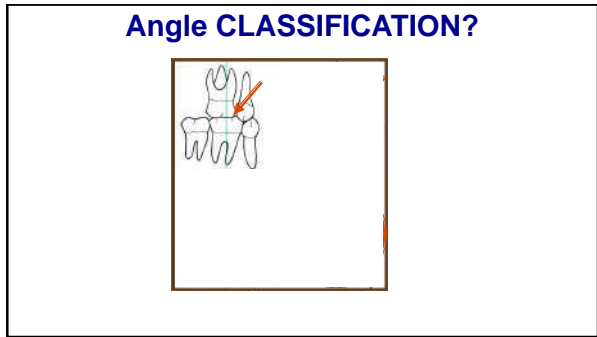
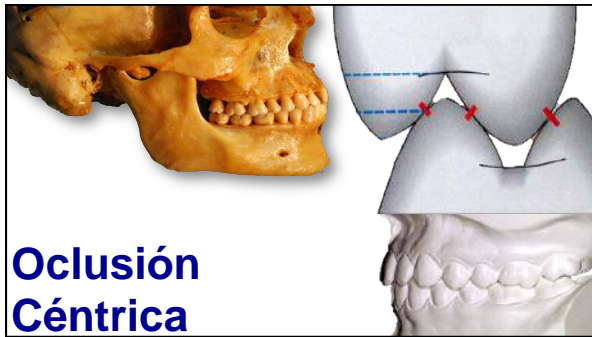
Reference: Clinical guidelines on management of the developing dentition and occlusion in pediatric dentistry. AAPD Reference Manual-2015.

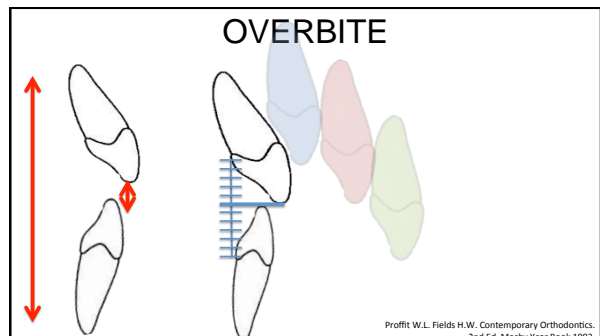
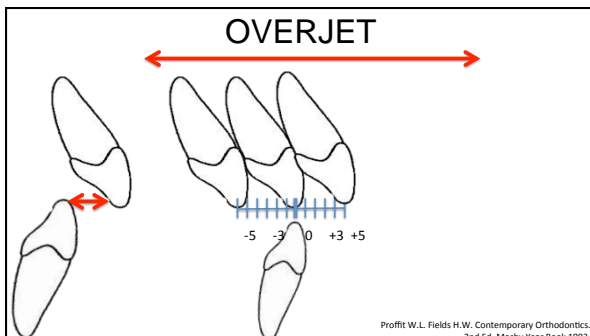
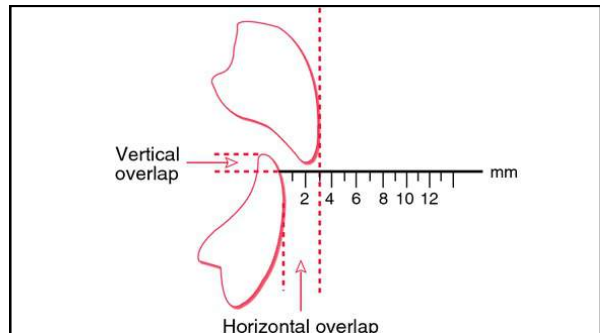
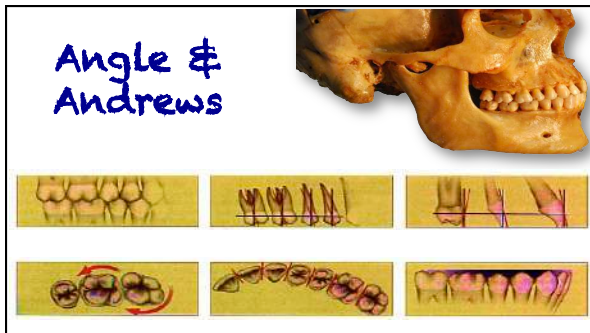
Primary Canine Relationship

- Best predictor of sagittal relationship in permanent dentition
- Mesial step → Class I
- Distal step → Class II
- Excessive mesial step → Class III

Reference: Clinical guidelines on management of the developing dentition and occlusion in pediatric dentistry. AAPD Reference Manual-2015.

*Ravn: primary canine relationship unstable between age 3y and 7y. Scand J Dent Res. 1980 Jun;88(3):165-70

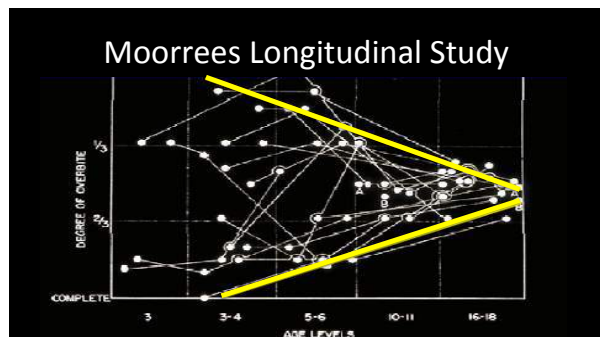


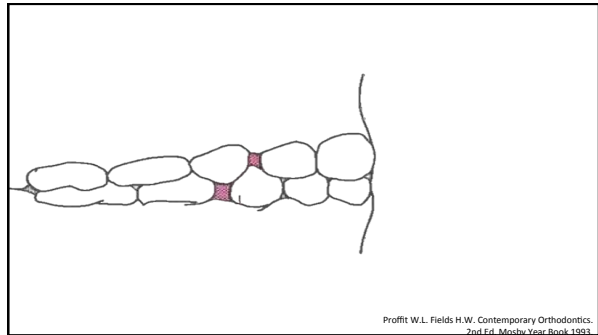
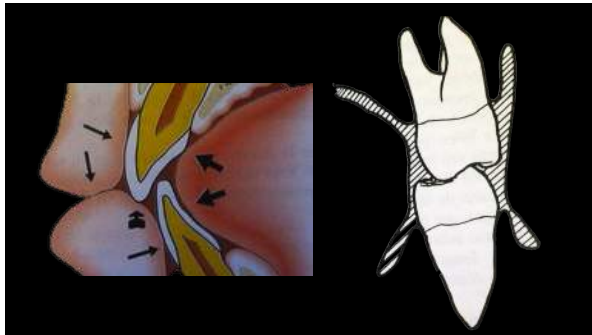


Primary Dentition:

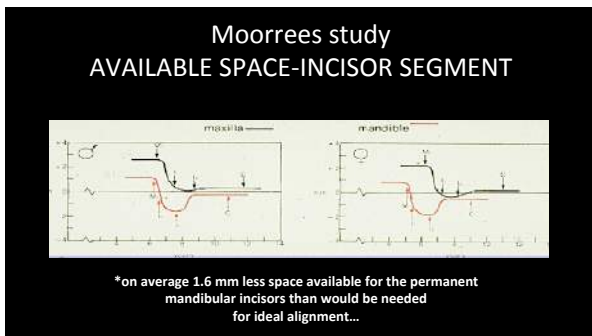
<p>Overbite</p> <ul style="list-style-type: none"> • Normal between 10-40% <ul style="list-style-type: none"> - 19% ideal - 37% reduced - 24% openbite - 20% excessive 	<p>Overjet</p> <ul style="list-style-type: none"> • Ideal: 0-4 mm <ul style="list-style-type: none"> - 28% ideal - 72% excessive
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Foster study of 100 British children





Proffit W.L. Fields H.W. Contemporary Orthodontics, 7th Ed. Mosby Year Book 1993



Primary Dentition: Spacing

- Primate spacing*
 - **Baume**: closes with early mesial shift
 - **Clinch**: closes with eruption and drift of lateral incisors
- Generalized spacing
 - Leighton study

↓ maxilla: distal to laterals
↑ mandible: distal to canines

Prediction of Crowding in the Permanent Dentition. B.C. Leighton

Primary dentition	Permanent dentition
Spacing \geq 6 mm	No crowding
Spacing 3-6 mm	20% crowding
Spacing < 3 mm	50% crowding
No spacing	86% crowding
Crowding	100% crowding

Incisor Liability (Moyné)

Permanent incisors	5.4 mm	10.8 mm
Permanent laterals	5.9 mm	11.8 mm
	Total width	22.6 mm
Primary centrals	4.2 mm	8.4 mm
Primary laterals	4.1 mm	8.2 mm
	Total width	16.6 mm
	Incisor liability	-6.0 mm ←

Prediction of Crowding in the Permanent Dentition. B.C. Leighton

Primary dentition	Permanent dentition
Spacing \geq 6 mm	No crowding
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Incisor Liability (Moyne)

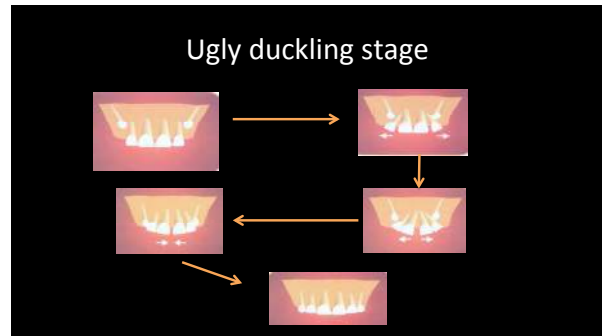
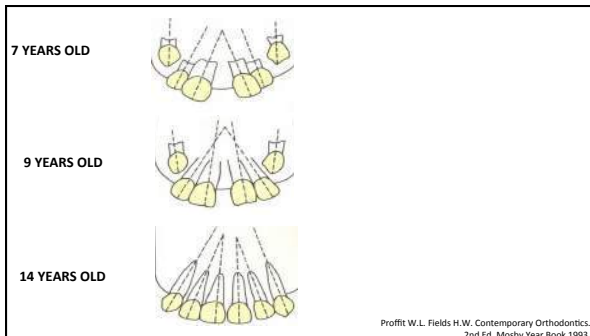
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Total width		16.6 mm
Incisor liability		-6.0 mm

AAPD Reference Manual-2015

Ideal Primary Dentition Occlusion (Burlington Study)

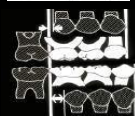
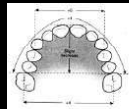
- Mesial step molars and canines
- Generalized and primate spacing
- 2 mm overjet
- 2 mm overbite (30%)

AAPD Reference Manual-2015



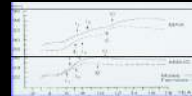
Factors affecting approach to Incisor Liability

- Size of teeth
- Spacing of primary dentition
- Intercanine arch width growth
- Archlength increase due to more labial positioning of permanent incisors
- Size differential between primary molars and premolars (leeway space)

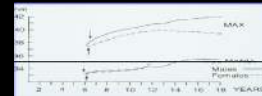


AAPD Reference Manual-2015

Intercanine Width Changes between Ages 2-18 years

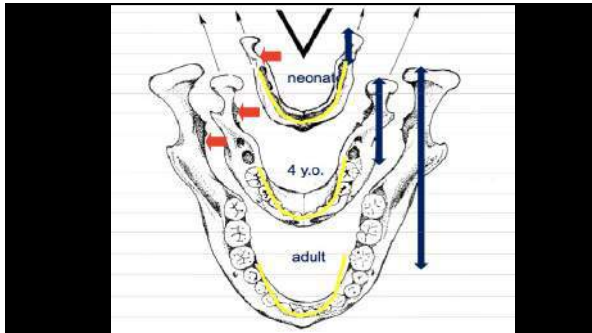


Intermolar Width Changes between 6-18 Years



Arch Length Changes between Ages 5-18 Years





Summary of Arch Changes

- Maxilla
 - Slight increase in archlength due to labial position of incisors and increased intercanine width
- Mandible
 - Loss of posterior archlength due to space closure (generalized and "E" space)
 - Slight increase in anterior archlength due to labial position of incisors and increased intercanine width

FREWAY SPACE

Four photographs showing the freeway space in a patient's mouth. The top-left photo shows a patient's mouth with a vertical ruler placed between the upper and lower teeth to measure the space. The top-right photo shows the patient's teeth in occlusion. The bottom-left photo shows the patient's mouth with a vertical ruler placed between the upper and lower teeth. The bottom-right photo shows the patient's teeth in occlusion.

Abduliabbar & Mehta.1997

Four photographs of dental models showing different occlusal conditions: Centric, Protrusive, Balance, and Working.

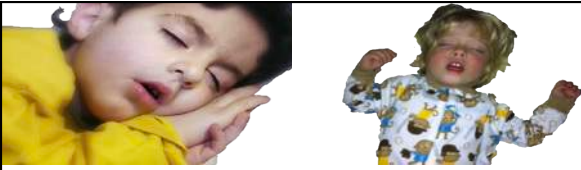
Abduliabbar & Mehta.1997

Four photographs of dental models showing arch length and width. The top-left photo shows a maxillary dental model. The top-right photo shows a maxillary dental model with a red line indicating a measurement of 11-13 mm. The bottom-left photo shows a maxillary dental model with colored dots indicating tooth positions. The bottom-right photo shows a mandibular dental model with colored dots indicating tooth positions.

Abduliabbar & Mehta.1997

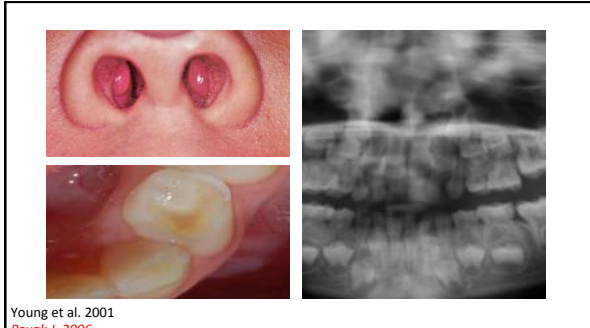
AIRWAYS

A diagram of the human respiratory system, showing the trachea, bronchi, and lungs. The word "AIRWAYS" is written in large blue letters above the diagram.




- Nose breathers can become mouth breathers
- This change can have big consequences .

Marin et al.1998
Gudiño & Peraza. 1991



Young et al. 2001
Pavuk J. 2006



Young et al. 2001
Pavuk J. 2006

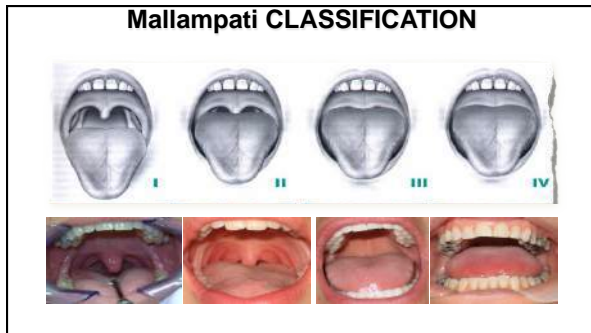
- Adam 1978
- Cheng 1988
- Chervin 2002
- Fan 1981
- Gonzalez 1995
- Havorld 1964, 1981
- Hojensgaard 1987
- Jefferson 1996
- Linder-Aronson
– 1970, 1975, 1979, 1986
- Marks 1965
- McNamara 1981
- McCaffrey 1979
- Moss 1962
- Moss and Salentijn 1969
- Ogura 1970
- Pratt 1970
- Quinn 1978
- Ricketts 1958
- Rocabado 1983
- Sassouni 1985
- Subtelny 1957
- Tarvonen 1987
- Tate 1963
- Timms 1988
- Trask 1987
- Vig 1980
- Warren 1987
- Watase 1998
- Wiemert 1986
- Wenzel 1985
- Woodside 1979

FACIAL CHANGES



CAMBIOS BUCALES:



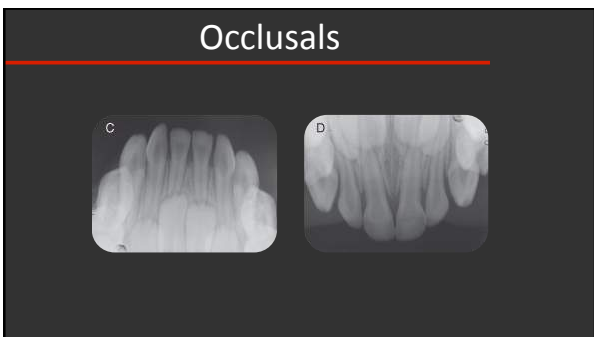
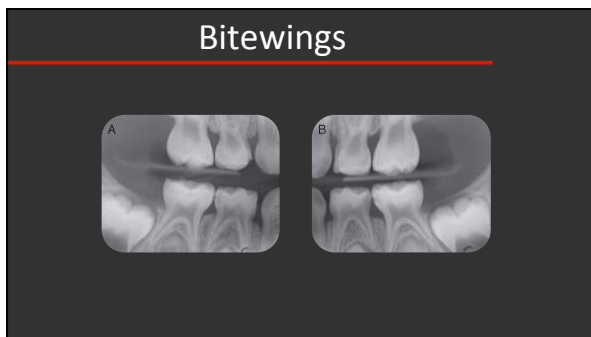


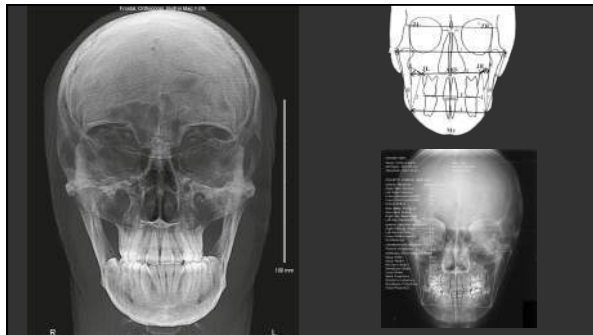
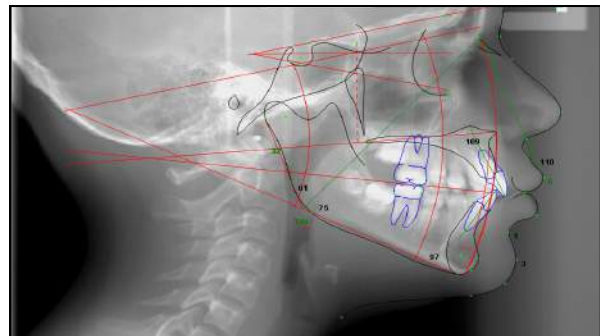
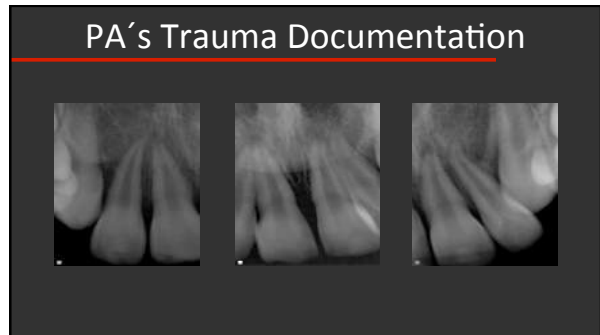
RADIOGRAPHS

Should I take X-RAYS?

- The timing of the initial radiographic examination should not be based upon the patient's age, but upon each child's individual circumstances.
- Radiographs should be taken only when there is an expectation that the diagnostic yield will affect patient care.

- RADIOGRAPHS**
- PA's
 - Bitewings
 - Occlusals
 - Panoramic
 - Lateral Cephalometric
 - Frontal Cephalometric
 - Others





Guidelines for Prescribing Dental Radiographs

NEW PATIENT				
PRIMARY DENTITION <small>(PRIOR TO ERUPTION OF THE 1ST PERMANENT TOOTH)</small>	MIXED DENTITION <small>(AFTER ERUPTION OF THE 1ST PERMANENT TOOTH)</small>	ADOLESCENT WITH PERMANENT DENTITION <small>(PRIOR ERUPTION OF THE 3RD MOLAR)</small>	ADULT, DENTATE OR PARTIALLY EDENTULOUS	ADULT, EDENTULOUS
Individualized PAs / occlusal and/or BW's if proximal surfaces cannot be visualized or probed.	Individualized x-rays consisting of BW's and a PANORAMIC or selected PA's.	Individualized x-rays consisting of BW's and a PANORAMIC or selected PA's.	Individualized x-rays consisting of BW's and a PANORAMIC or selected PA's.	Individualized x-rays based on clinical signs and symptoms.
Patients without disease and with open contacts may not require x-rays at this time.		A full mouth intraoral X-rays if generalized dental disease or a history of extensive dental treatment.	A full mouth intraoral X-rays if generalized dental disease or a history of extensive dental treatment.	

American Academy of Pediatric Dentistry. *Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs- 2015.* Available at: http://www.aapd.org/media/PolicyGuidelines/R_Radiographs.pdf Accessed August 5, 2016.

Guidelines for Prescribing Dental Radiographs

	PRIMARY DENTITION (PRIOR TO ERUPTION OF THE 1ST PERMANENT TOOTH)	RECALL MIXED DENTITION (AFTER ERUPTION OF THE 1ST PERMANENT TOOTH)	ADOLESCENT WITH PERMANENT DENTITION (PRIOR ERUPTION OF THE 3RD MOLAR)	ADULT, DENTATE OR PARTIALLY EDENTULOUS
Caries or at increased risk for caries.	BW's at 6-12 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 6-12 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 6-12 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 6-18 months intervals if proximal surfaces cannot be examined visual or with a probe.
No caries and not at increased risk for caries.	BW's at 12-24 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 12-24 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 18-36 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 24-36 months intervals if proximal surfaces cannot be examined visual or with a probe.

American Academy of Pediatric Dentistry. Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs. 2015. Available at: "http://www.aapd.org/media/Polices_Guidelines/E_Radiographs.pdf" Accessed August 5, 2015.

Guidelines for Prescribing Dental Radiographs

	PRIMARY DENTITION (PRIOR TO ERUPTION OF THE 1ST PERMANENT TOOTH)	MIXED DENTITION (AFTER ERUPTION OF THE 1ST PERMANENT TOOTH)	ADOLESCENT WITH PERMANENT DENTITION (PRIOR ERUPTION OF THE 3RD MOLAR)	ADULT, DENTATE OR PARTIALLY EDENTULOUS
Periodontal Disease	Judgment to decide in Imaging that may consist of, but is not limited to, selected BW's and/or PA's of areas where periodontal disease (other than nonspecific gingivitis) can be identified clinically.			
Growth & Development.	Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth and development.		Same info as primary and mix dentition plus panoramic or PA's for assess development of 3rd molars.	
Other circumstances: implants, pathology, restorative/endo, perio and caries remineralization	Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring in these circumstances.			

American Academy of Pediatric Dentistry. Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs. 2015. Available at: "http://www.aapd.org/media/Polices_Guidelines/E_Radiographs.pdf" Accessed August 5, 2015.

† Clinical situations in which radiographs may be indicated include but are not limited to:

A. Positive Historical Findings:

1. Previous periodontal or endodontic treatment
2. History of facial trauma
3. Familial history of dental anomalies
4. Postoperative evaluation of healing
5. Remineralization monitoring
6. Presence of implants or evaluation for implant placement

B. Positive Clinical Signs/Symptoms

1. Clinical evidence of periodontal disease
2. Large or deep restorations
3. Deep carious lesions
4. Malocclusion or clinically impacted teeth
5. Swelling
6. Evidence of dental/facial trauma
7. Mobility of teeth
8. Sinus tract ("Pusult")
9. Clinically suspected sinus pathology
10. Growth abnormalities
11. Oral involvement in known or suspected systemic disease
12. Positive neurologic findings in the head and neck
13. Evidence of foreign objects
14. Pain and/or dysfunction of the temporomandibular joint
15. Facial asymmetry
16. Abutment teeth for fixed or removable partial prosthesis
17. Unexplained bleeding
18. Unexplained sensitivity of teeth
19. Unusual eruption, spacing or migration of teeth
20. Unusual tooth morphology, calcification or color
21. Unexplained absence of teeth
22. Clinical odonon

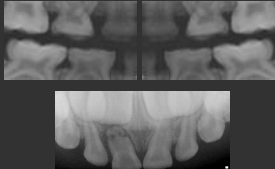
**** Factors increasing risk for caries may include but are not limited to:**

1. High level of caries experience or demineralization
2. History of recurrent caries
3. High levels of cariogenic bacteria
4. Challenging restorations of poor quality
5. Poor oral hygiene
6. Inadequate fluoride exposure
7. Prolonged nursing (bottle or breast)
8. Frequent high sucrose content in diet
9. Poor family dental health
10. Developmental or acquired enamel defects
11. Developmental or acquired disability
12. Xerostomia
13. Genetic abnormality of teeth
14. Many multi-surface restorations
15. Chemotherapy therapy
16. Lating disorders
17. Drug/alcohol abuse
18. Irregular dental care

Initial Exam

Without previous radiographs:

- **Primary Dentition:**
 - Bitewings, if we don't have a direct view.
- **Mix Dentition:**
 - Bitewings & Panoramic.
- **Permanent:**
 - 4 Bitewings.¹




American Academy of Pediatric Dentistry. Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs. 2015. Available at: "http://www.aapd.org/media/Polices_Guidelines/E_Radiographs.pdf" Accessed August 5, 2015.

Recall patient.

With previous radiographs.

- **DMF's or High risk patients:**
 - Bitewings
 - Primary and Mix dentition every 6 months or until no evident caries.
 - Permanent every 6 or 12 months.
- **No DMF's or low risk patients:**
 - Bitewings
 - Primary and Mix dentition every 12-24 months.
 - Permanent every 18 or 24 meses.
- **Periodontal disease:**
 - Complete series of PA's and BW's



American Academy of Pediatric Dentistry. Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs. 2015. Available at: "http://www.aapd.org/media/Polices_Guidelines/E_Radiographs.pdf" Accessed August 5, 2015.

Tecnología de la imagenología



0.5T Agilent 45 cm bore system
Chin K. NG
ckng0001@exchange.louisville.edu

Tomografía axial computerizada de un Conebeam CT
(17-19 I-CAT, Imaging Science International, Hatfield PA)



PRECAUTIONS

- Every precaution should be taken to minimize radiation exposure, protective thyroid collars and aprons should be used whenever possible. This practice is strongly recommended for children, women of childbearing age, and pregnant women."

American Dental Association, US Dept of Health and Human Services. The selection of patients for dental radiographic examinations: 2004. Available at: [http://www.aahp.org/sections/dentistry/pdfs/radiography_examinations\(1\).pdf](http://www.aahp.org/sections/dentistry/pdfs/radiography_examinations(1).pdf). Accessed June 25, 2014.

TREATMENT PLANNING

Review-Standard of Care Recommendation

- RISK ASSESMENT
- Ongoing risk assessment
 - CRA FORM/CAT TOOL
 - Diagnostic codes
 - risk assessment CODES
- Biofilm & Biomarkers
- How to monitor caries



Tinanof, N.

AAPD Reference Manual-2015.

Table 2. Caries-risk Assessment Form for 6-5 Year Olds¹⁰⁰⁶
(for Dental Provider)

Factors	High Risk	Medium Risk	Low Risk
Biological			
Mother/paternal caregiver has active caries	Yes		
Parent/caregiver has low socioeconomic status	Yes		
Child has >5 between meal sugar-containing snacks or beverages per day	Yes		
Child is pre- or fed with a bottle containing cereal or solid sugar	Yes		
Child has special health care needs		Yes	
Child is a recent immigrant		Yes	
Preventive			
Child receives optimally-fluoridated drinking water or fluoride supplements			Yes
Child has tooth brushed daily with fluoride toothpaste			Yes
Child receives topical fluoride from health professional			Yes
Child has dental home/regular dental care			Yes
Clinical Findings			
Child has ≥1 observed untreated carious	Yes		
Child has active white spot lesions or enamel defects	Yes		
Child has observed or x-ray impaction levels			Yes
Child has plaque on teeth			Yes

Using these conditions that apply to a specific patient helps the practitioner and parent understand the factors that contribute to or prevent their caries. Risk assessment categorization of low, medium, or high is based on preponderance of factors for the individual. However, clinical judgment may justify the use of one factor (eg, frequent exposure to sugar-containing snacks or beverages, even if one child is demonstrating overall risk).

Overall assessment of the child's dental caries risk: High Moderate Low

Factors	High Risk	Medium Risk	Low Risk
Biological			
Mother/paternal caregiver has active caries	Yes		
Parent/caregiver has low socioeconomic status	Yes		
Child has >5 between meal sugar-containing snacks or beverages per day	Yes		
Child is pre- or fed with a bottle containing cereal or solid sugar	Yes		
Child has special health care needs		Yes	
Child is a recent immigrant		Yes	
Preventive			
Child receives optimally-fluoridated drinking water or fluoride supplements			Yes
Child has tooth brushed daily with fluoride toothpaste			Yes
Child receives topical fluoride from health professional			Yes
Child has dental home/regular dental care			Yes
Clinical Findings			
Child has ≥1 observed untreated carious	Yes		
Child has active white spot lesions or enamel defects	Yes		
Child has observed or x-ray impaction levels			Yes
Child has plaque on teeth			Yes

Using these conditions that apply to a specific patient helps the practitioner and parent understand the factors that contribute to or prevent their caries. Risk assessment categorization of low, medium, or high is based on preponderance of factors for the individual. However, clinical judgment may justify the use of one factor (eg, frequent exposure to sugar-containing snacks or beverages, even if one child is demonstrating overall risk).

Overall assessment of the child's dental caries risk: High Moderate Low

CODES

NEW PATIENT EXAM		RECALL	
CODE	TREATMENT	CODE	TREATMENT
D0150	Comprehensive oral evaluation	D0120	Recall exam
D0272	2 BW's	D0272	2 BW's
D0272	4 BW's	D1120	Prophy (13YO)
D0330	Panorex	D1208	Fluoride
D0220	PA	EMERGENCY	
D1120	Prophy (13YO)	CODE	TREATMENT
D1110	Prophy (14YO)	D0140	Emergency
D1208	Fluoride		

How to monitor caries...



- Diagnodent --- To check remineralization--- NOT TO TREAT
 - Early diagnose 500 microns demineralization
 - DO BACTERIAL COUNT at 6 months of AGE



ISOLATION



RESTORATIVE MATERIALS



Primary Dentition					
CLASS I	CLASS II	CLASS III	CLASS IV	CLASS V	CLASS VI
I NI	I NI	I NI	I NI	I NI	I NI
CC	CC	CC	CC	CC	CC
CC	CC	CC	CC	CC	CC
SSC	SSC		SSC	SSC	SSC

Permanent Dentition					
CLASS I	CLASS II	CLASS III	CLASS IV	CLASS V	CLASS VI
I NI	I NI	I NI	I NI	I NI	I NI
CC	CC	CC	CC	CC	CC
CC	CC	CC	CC	CC	CC
SSC	SSC		SSC	SSC	SSC
PFM			PFM		PFM

AAPD Reference Manual 2015

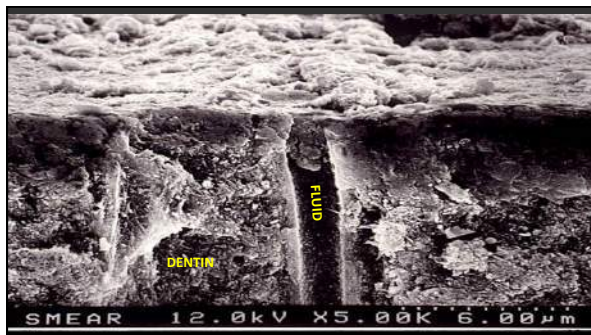
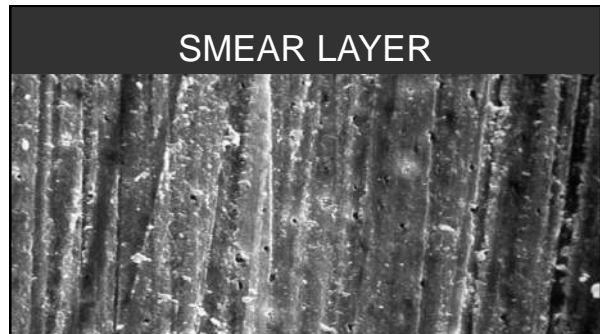
HIGH VS SLOW
Murdoch-Kinch CA, McLean ME 2003. Minimally invasive dentistry. Journal of the American Dental Association 134:87-95

WITH WATER VS WITHOUT WATER
Murdoch-Kinch CA, McLean ME 2003. Minimally invasive dentistry. Journal of the American Dental Association 134:87-95

ISOLATION VS NO ISOLATION
Gilbert GH 2010. Rubber dam use during routine operative dentistry procedures: findings from The Dental PBRN. Oper Dent. ; 35(5): 491-499.

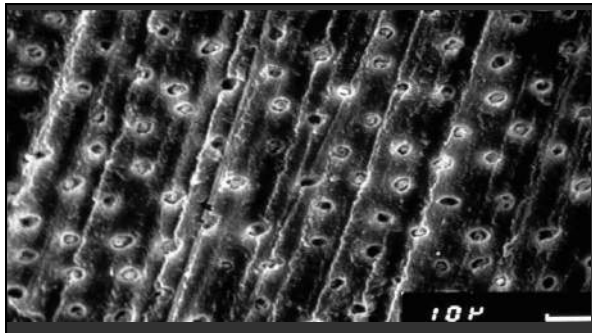
BOTTLE VS UNIDOSE
Kithkadatta J. 2010. Clinical effectiveness of contemporary dentin bonding agents. J Conserv Dent. 13(4): 173-183.

CARBIDE VS DIAMOND



CONDITIONER

ACID ETCH



DENTAL MATERIALS-ACID ETCH

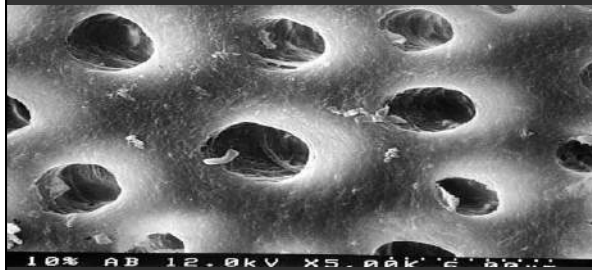
1. Redford 1986
- 10% AF



ETCHING TIME PERMANENT DENTITION				
	15s	30s	60s	120s
Media (micrones)	9	12	14	50

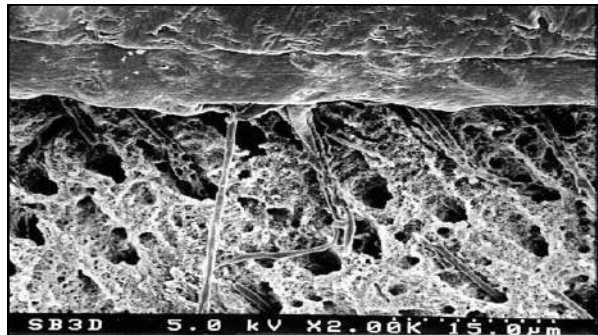
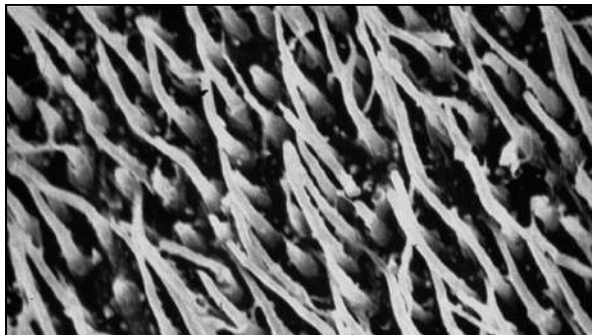
Hitt and Feigal, 1992 (Pediatr Dent)
Feigal et al., 1993 (JADA)
Feigal et al., 2000 (J Dent Res)

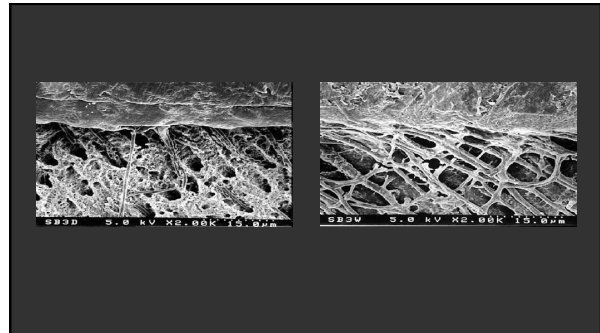
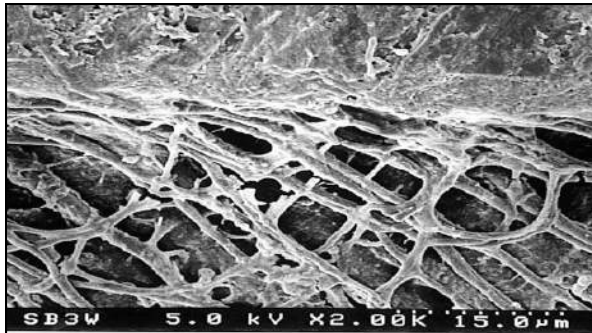
10% PHOSPHORIC ACID (15 segs.)



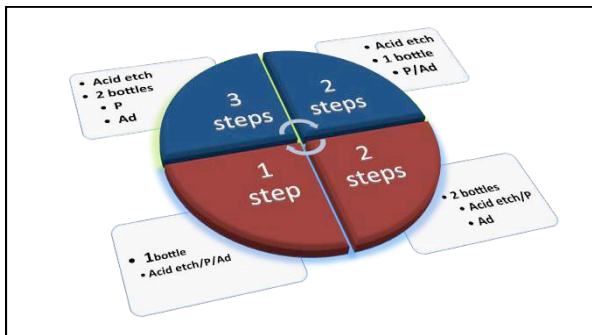
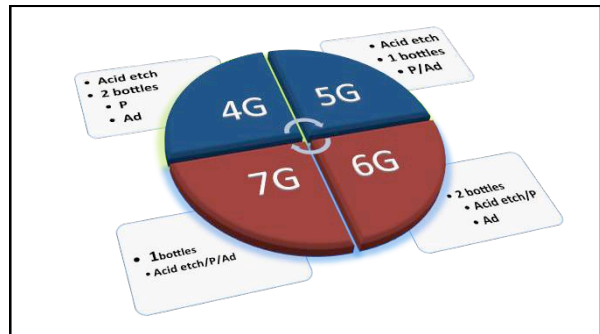
PRIMER (Methacrylate)

- Dehydrating agents
 - Aldehyde
 - Acetone
 - Alcohol





BONDING AGENTS

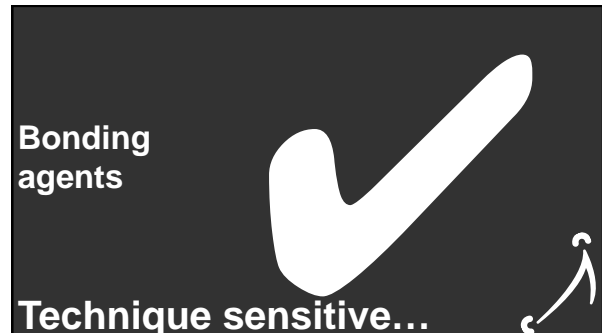
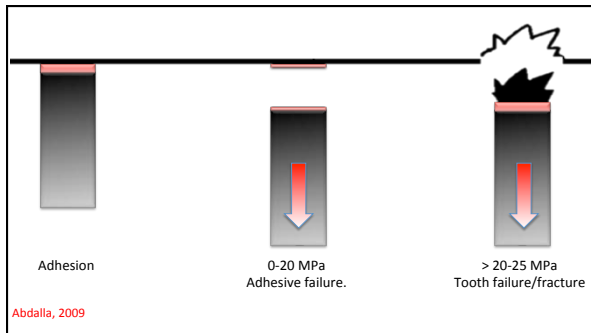


Type of dentin	Adhesive SE MPa	Adhesive TE MPa
Dentin (sound)	44.9 ± 14.6	50.9 ± 3.9
Dentin-affected	23.3 ± 5.0	28.8 ± 6.3
Dentin-infected	15.2 ± 3.6	19.4 ± 4.4

Yoshiyama 2002

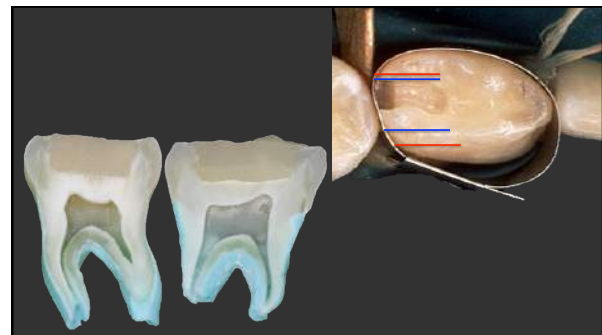
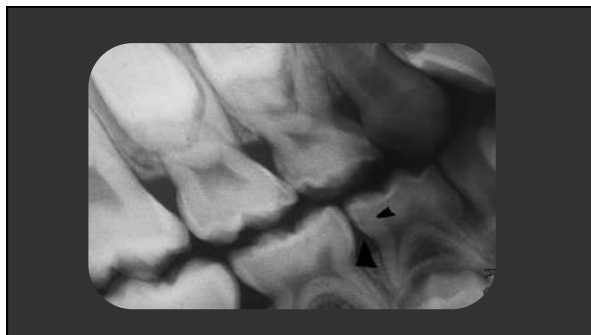
Adhesive	Generation	Adhesives TE MPa
Clearfil SE Bond	6G	37.5 ± 5.5
FuturaBond Nr	6G	39.3 ± 4.3
AdheSE Bond	6G	36.5 ± 5.2
Hybrid Bond	4G	31.5 ± 4.7
Admira Bond	5G	41.3 ± 6.2

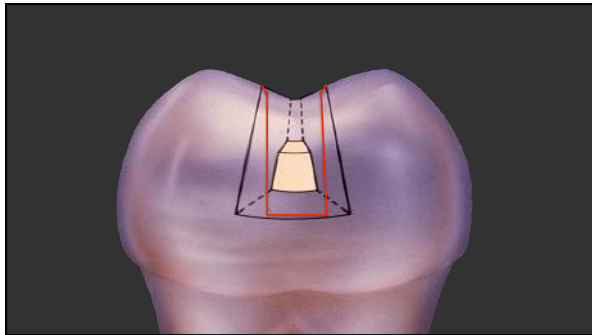
Abdalla, 2007



- ### Restorative materials "esthetic color"
- Silicate cements
 - Glass ionomer cements
 - Compomers
 - Resin modified glass ionomer RMGI's
 - Composites (Resin // "STRIP CROWNS")
 - SSC-Modified
 - Zirconia Crowns

ISOLATION





Restorations Evaluated

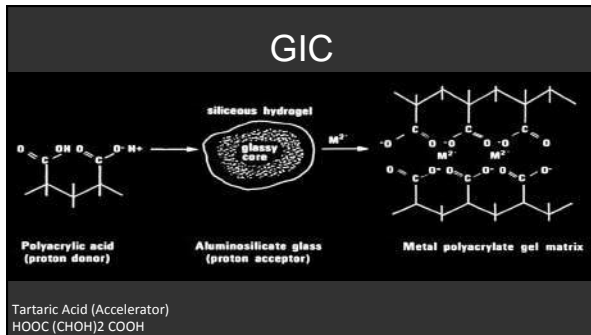
Type of Restoration	Number of Restoration Evaluated	Age of Patient When Restoration Placed (Mean + S.D.)	Age Restoration (Mean + S.D.)
Class I	393	4 yrs. 8mo. + 1yr. 4mo.	4 yrs. 3mo. + 1yr. 1mo.
Class II	406	5 yrs. 10mo. + 1yr. 3mo.	4 yrs. 1mo. + 1yr.
Class III	15	5 yrs. 7mo. + 1yr. 3mo.	4 yrs. 5mo. + 1yr. 1mo.
Class V	60	4 yrs. 10mo. + 1yr. 3mo.	4 yrs. 2mo. + 1yr. 2mo.
Total	864	5 yrs. 2mo. + 1yr. 5mo.	4 yrs. 2mo. + 1yr. 1mo.

Clinical Evaluation Data

Characteristics	Type of Restoration	Rating*
Wear	Class I	A-353 (89.8%), B-11 (2.8%), C-29 (7.4%)
	Class II	A-349 (86.0%), B-30 (7.4%), C-27 (6.6%)
	Class III	A-15 (100%)
	Class V	A-50 (100%)
Marginal Integrity	Class I	A-353 (89.8%), B-11 (2.8%), C-29 (7.4%)
	Class II	A-349 (86.0%), B-30 (7.4%), C-27 (6.6%)
	Class III	A-15 (100%)
	Class V	A-49 (98.0%), B-0 (0%), C-1 (2.0%)
Axial Contour	Class I	NA
	Class II	A-349 (86.0%), B-30 (7.4%), C-27 (6.6%)
	Class III	A-15 (100%)
	Class V	NA
Secondary Caries Class I	Class I	A-393 (100%)
	Class II	A-405 (99.8%), C-1 (0.2%)
	Class III	A-15 (100%)
	Class V	A-50 (100%)

* Ratings were as follows: Alfa, or A, clinically ideal; Bravo, or B, clinically acceptable; Charlie, or C, clinically unacceptable.36





COMPOMER

Dyract®
(L.D. Caulk/Dentsply)
Compoglass®
(Vivadent/Ivoclar)
Hytac®
(ESPE)

FILLER

RESINS (Cross-section SEMs)

Z100

Bis-GMA

EGDMA molecular weight 226
Bis-GMA molecular weight 332

Filtek Z250

Bis-EMA

Bis-EMA molecular weight 226
UDMA molecular weight 176

FLOWABLE COMPOSITES

Product-company	filler %	fluoride	Compression strenght(MPa)
Aeliteflo - Bisco	60	No	288
Versaflo-Centrix	63	Yes	220
Crystal Conf-Dental - Essence Products	64	Yes	225
Star Flow - Danville, Engineering	61	Yes	380
Flo Restore - Den-Mat	?	Yes	?
True-Look - Denpac Fivestars	70.5	Yes	254
Durafil Flow - Kulzer	46	No	400
Tetric-Flow - Ivoclar	68	Yes	230
Flow-It - Jeneric/Pentron	75.5	Yes	250
Revolution - Kerr	55	No	290





eliminate **Myths // DOGMAS...**

Restorative materials

- **AMALGAM- Kilpatric, 2007**
 - Amalgam: aproved for primary dentition in (2 surface Class II, Clases I y V) and in permanent (Clase I, II y V).

Predictions: Mean Survival Time

STUDY	Pt AGE	MTS
Holland	3 years	11 months
Holland	7-8 years	44 months
Levering & Messer*	<4 years	5 years (51%)
Levering & Messer*	>4 years	5 years (70%)
Roberts & Sheriff	4-5 years	>7.5 years
Welbury et al	5-11 years	41.1 months †

*%prediction of success (amalgams Class II)
† Prospective study

Restorative Materials

Vs

Amalgama Vs Resina- Soncini, 2007

- Recall appointments every 6 months for 5 years.
- 267 (6-10 years) **Amalgams vs Compomers** in primary teeth
 - 6% of the compomers were replaced (Recurrent caries)
 - 0.5% of the amalgams were replaced (Recurrent caries)

Statistical significance
- 267 (6-10 years) **Amalgams vs Composites** in permanent teeth
 - 12% of the composites were replaced (Recurrent caries)
 - 11% of the amalgams were replaced (Recurrent caries)

No statistical significant

Materiales de Restauración

Vs

COMPOSITE-

(Z100) As good as amalgam
WEAR 50 MICRONS A YEAR
WEAR 250 MICRONS OVER 5 YEARS
halogen light-Silorane decrease shrinkage to 1%

AAPD Reference Manual 2015

AMALGAMS VS HEALTH

- Dalen, 2003 – no correlation detected between **memory** and exposure to amalgam.
- Hujoel, 2005 – no evidence that amalgam placed during pregnancy increased **low-birth-weight risk**.
- Bellinger, 2007 – no evidence that amalgam produced adverse **neuropsychological** effects over 5 yrs.
- Lauterbach, 2008 – amalgam did not affect **neurological** status of children.
- Roberts, 2008 – no change in **resistance to mercury or antibiotics** in children with or without amalgam fillings.

AMALGAMS



Competencies

- Initial Exam / Treatment Planning (2)
- Sealants (4)
- Class II (1)
- Pulpotomy (1)
- Stainless Steel Crown (1)
- Space Management (1)
- Nitrous Oxide (1)

PULP THERAPY



PULP FACTS

- Anatomical Differences
 - Primary pulps larger
 - Primary root canals are smaller
 - Primary molar roots have more variable anatomy
 - Primary teeth predisposed to internal resorption



Options

- Pulp therapy for the primary dentition includes a **variety of options**, depending on the **vitality of the pulp**.

It is difficult if not impossible to determine clinically the **histologic status** of the pulp.

We attempt to do this by using clinical and **radiographic information**.

Pulp Therapy in Primary and Young Permanent Teeth

Assessment of Pain

Types of Pain	Pulp Status
Spontaneous Nocturnal Constant	Irreversible: Non-vital treatment
Thermal Chemical Intermittent	

Further Clinical Assessment

- Extent of lesion
 - location, color
- Mobility
 - Rule out root resorption
- Soft tissue swelling
- Lymphadenopathy
- Sensitivity to Percussion
 - reliable in primary teeth
- Pulp exposure
 - hemorrhagic vs necrotic
- Pulp testing
 - electrical
 - thermal
 - percussion



- Redness
- Swelling
- Gross caries
- Missing or fractured restoration
- Carious marginal breakdown
- Draining parulis
- Fluctuation felt by palpation
- Mobility
- Thermal and electrical vitality tests

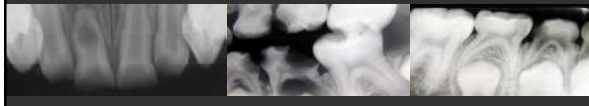
Reliability of Pulp Testing

Teeth	Primary	Young permanent	Mature permanent
Electrical	-	+	+
Thermal	+	+	++
Percussion	++	+	+

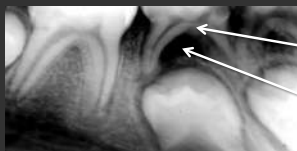
No single diagnostic test is reliable

Radiographic Criteria for Healthy Pulp

- Adequate periodontal support
- No decalcified lesions or root fractures
- No internal/external resorption or radiolucency



Radiographic Assessment



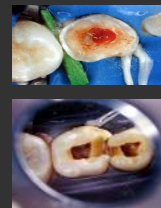
Moss et al 1965:
accessory canals in furcation
area

no vital pulp tissue with
interradicular bone loss

Wrbas et al 1997:
77.5% of mandibular primary molars had accessory
canals in floor of chamber

Operative Diagnosis

- Direct evaluation of the pulp tissue
- Nature of the bleeding
- Red color and hemostasis in less than 4 minutes indicates radicular vitality
- Persistent bleeding indicates infection has reached radicular pulp



Vital Pulp Therapy

- Protective base/liner
- Indirect pulp treatment (IPT)
- Direct pulp capping (DPC)
- Pulpotomy
 - pharmacotherapeutic
 - non-pharmacotherapeutic
- Partial pulpotomy (permanent teeth)

Vital Pulp Therapy

- **Protective base/liner**
- Indirect pulp treatment (IPT)
- Direct pulp capping (DPC)
- Pulpotomy
 - pharmacotherapeutic
 - non-pharmacotherapeutic
- Partial pulpotomy (permanent teeth)

Protective Base/Liner

- Indications (AAPD):
 - normal pulp
 - preparation in dentin
 - all caries removed
- Objectives
 - preserve pulpal vitality
 - minimize microleakage/sensitivity

Vital Pulp Therapy

- Protective base/liner
- Indirect pulp treatment (IPT)
- Direct pulp capping (DPC)
- Pulpotomy
 - pharmacotherapeutic
 - non-pharmacotherapeutic
- Partial pulpotomy (permanent teeth)

Indirect Pulp Treatment

- Indications
 - deep carious lesions
 - reversible pulpitis
 - incomplete caries removal
 - no pulp exposure
 - pulp vital
- Objectives
 - complete seal, preserve vitality, no post-treatment symptoms, no harm to succedaneous teeth, continued root development in permanent teeth



IPT Technique

- Apply medicament/material over carious or sound dentin [$\text{Ca}(\text{OH})_2$ most commonly used]
- Vitality should be preserved
- If planning to re-enter, wait 6-8 weeks for tertiary dentin; remove remaining caries, restore; *eliminate microleakage*

IPT Technique

- Need to re-enter controversial
- Radiolucency beneath IPT decreased in size or did not increase under Dycal/ZOE in majority of cases (Maltz et al 2007)
- Success rate up to ~90%

IPT in Primary Teeth

Recent data:

- IPT (GIC) had higher success rate than FMC pulpotomies Farooq et al 2000; Vij et al 2004
- IPT ($\text{Ca}(\text{OH})_2$) success rate in primary molars was 95% in retrospective study Al-Zayer et al 2003
- Carious dentin undergoes mineral gain when sealed in IPT Oliveira et al 2006

Indirect Pulp Treatment

- Vij et al 2004

	0 – 1 year	1 – 2 years	2 – 3 years	> 3 years
FMC success	95%	84%	76%	70%
IPT success	98%	96%	94%	94%

Treatment of deep dentinal lesions with caries control

Deep Caries

- Thin dentin over pulp
- Tubules are large in diameter and packed close together
- Dentin is extremely permeable

Indirect Pulp Treatment



Indirect Pulp Capping Success Rates Higher Than 90%

Study	Number of Teeth	Procedure/Material	Success Rate (%)
Woods et al., 1963 (Clinical)	472	Indirect-ZnO ₂	97
	186	Direct-Zn(OO) ₂	93
Umezaki et al., 1953 (Histological)	84	Indirect	88
	32	Direct	87
King et al., 1965	21	Indirect-Ca(OH) ₂	61.5 sterile dentin
	22	Indirect-ZnO ₂	81.8 sterile dentin
Aponte et al., 1966	30	Indirect-Ca(OH) ₂	93
Barbosa et al., 1967	36	Indirect-ZnO ₂	92
	41	Indirect-Ca(OH) ₂	92
Hutchins et al., 1972	35	Indirect-ZnO (TRN)	94
Wardman et al., 1976	32	Indirect-Ca(OH) ₂	81
	32	Self-ZnO ₂	91

Caulk® Dycal® Reinforced CaOH



Indirect Pulp Cap



Vital Pulp Therapy

- Protective base/liner
- Indirect pulp treatment (IPT)
- **Direct pulp capping (DPC)**
- Pulpotomy
 - pharmacotherapeutic
 - non-pharmacotherapeutic
- Partial pulpotomy (permanent teeth)

Direct Pulp Cap

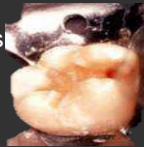


Indications

- Small **mechanical** or **traumatic** exposure in **primary** teeth with normal pulp.
 - Small **carious** or **mechanical** exposure in **permanent** teeth with normal pulp.
 - **Contraindicated for carious exposure in primary teeth.**
- Preserve vitality
 - No post-treatment signs or symptoms
 - Pulp healing
 - Tertiary dentin
 - No pathologic changes
 - No harm to successors
 - Continued root formation for permanent teeth

Direct Pulp Cap: Objectives (AAPD)

- Preserve **vitality**
- No post-treatment signs or symptoms
- Pulp **healing**
- **Tertiary** dentin
- No pathologic changes
- No harm to successors
- **Continued root formation** for permanent teeth



Pulp Capping Agents


- Mineral trioxide aggregate (MTA)
- Ca(OH)_2 still widely used and taught
- ZOE – chronic inflammation
- Total etch technique

Direct Pulp Cap - Bleeding

- Success *inversely* related to bleeding at site
- Debris at exposure site: clean out with **saline** or **anesthetic** to prevent inflammation; keep pulp moist
- Clot will prevent contact of material with the pulp
- Success rate up to 80-90% when bleeding is well controlled

Direct Pulp Capping

Direct Pulp Capping



Direct Pulp Capping

- Even in these cases success rates are not particularly high
- Failure results in **internal resorption** or acute dentoalveolar **abscess**
- **Direct pulp cap** success rate on primary teeth is **not as great as pulpotomy**

Vital Pulp Therapy

- Protective base/liner
- Indirect pulp treatment (IPT)
- Direct pulp capping (DPC)
- Pulpotomy
 - pharmacotherapeutic
 - non-pharmacotherapeutic
- **Partial pulpotomy (permanent teeth)**

Partial Pulpotomy-Criteria

- **No** pain or recent **pain** of **short** duration
- **No** swelling, mobility, reaction to percussion
- **No** internal/external resorption, changes in PDL, radiographic abnormalities
- Pulp exposure **1-2 mm**, bleeding stops **<1-2 min**
- Inflammation, infection superficial only
- Only **superficial pulp removed**

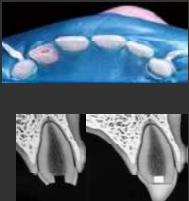
Mass et al 1995

Partial Pulpotomy Technique

- Enlarge exposure, removing exposed pulp tissue
- Place capping material
- Place leak-proof seal
 - ZOE covered with GIC or calcium hydroxide if resin composite is to be used

OBJECTIVES (AAPD)

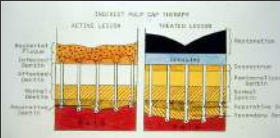
- Remaining pulp stays vital
- No adverse clinical signs/symptoms
- **Continued apexogenesis** in immature teeth



Partial Pulpotomy

ADVANTAGES

- removes inflamed, infected portion of pulp
- preserves **cell-rich coronal pulp**
- facilitates washing away carious debris
- allows better contact with more material
- increases healing potential
- physiologic apposition of cervical dentin
- no need for root canal therapy
- natural color/translucency preserved



Vital Pulp Therapy

- Protective base/liner
- Indirect pulp treatment (IPT)
- Direct pulp capping (DPC)
- Pulpotomy
 - pharmacotherapeutic
 - non-pharmacotherapeutic
- Partial pulpotomy (permanent teeth)

Pulpotomy for Primary Teeth

Indications:

- deep lesion adjacent to pulp that is normal or reversibly inflamed, or
- pulp exposed by trauma
- coronal tissue can be amputated
- remaining radicular tissue vital (clinically and radiographically)

Objectives

- preserve vitality of radicular pulp
- no adverse signs or symptoms
- no radiographic pathology
- no harm to succedaneous teeth

Technique

- Prepare tooth for restoration (typically SSC)
- Excavate carious dentin, unroof pulp chamber
- Amputate coronal pulp
- Hemostasis (diagnostic value)
- Treat remaining pulp (medicament/energy)
- Seal and restore

Pulpotomy: Clinical Indications

- Mechanical/carious exposure, trauma
- Inflammation limited to coronal pulp
- Absence of spontaneous pain
- Absence of swelling or alveolar abscess formation
- Restorable tooth



Pulpotomy Contraindications

- Presence of fistula or swelling
- Evidence of necrotic pulp
- Uncontrolled pulpal hemorrhage
- Periapical or bifurcation radiolucency
- Pathologic resorption
- Dystrophic calcification
- More than 1/3 root resorption

Categories of Medicaments

- Fixatives
 - FMC, glutaraldehyde
- Mineralizing and/or bacteriostatic agents $\text{Ca}(\text{OH})_2$
- Palliative sealers
 - ZOE
- Obturators
 - mineral trioxide aggregate (MTA)
- Coagulants
 - iodoform, $\text{Ca}(\text{OH})_2$
- Antibiotics/Antimicrobials
 - erythromycin, others

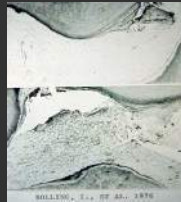
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- Antibiotics/Antimicrobials
 - erythromycin, others

Pulpotomy

Pulpotomy

- The radicular pulp is healthy or is capable of healing after surgical amputation of the affected or infected coronal pulp
- Presence of any signs or symptoms of inflammation extending beyond the coronal pulp is a contraindication



Pulpotomy Contraindications

- Swelling of pulpal origin
- Fistula
- Pathologic **mobility**
- Pathologic **external** root resorption
- **Internal** root resorption
- Periapical or interradicular radiolucency
- Pulp calcifications
- **Excessive bleeding from amputated radicular stumps**
- Hx. of spontaneous or **nocturnal** pain
- Pain or tenderness to percussion or palpation

Formocresol Pulpotomy Technique

- Local anesthesia and rubber dam
- Remove superficial caries
- Remove roof of the pulp chamber
- Amputate the coronal pulp
- Place moist cotton pellets to obtain hemostasis
- Following hemostasis place **formocresol pellet for 5 minutes**
- Remove the pellet and cover the **floor of chamber with ZOE Caulk® 2200®**
- Fill access with alloy if temporizing or place SSC same appointment

Remove superficial caries to minimize bacterial contamination following exposure



Remove the roof of the pulp chamber with a #330 bur in high speed



Amputate Coronal Pulp

- Sharp spoon excavator
- #4 round bur in slow speed
- Beware of perforating pulpal floor
- Don't leave tags of tissue under ledges of dentin



Place cotton pellets over each amputation site and apply pressure to obtain hemostasis



When cotton is removed, hemostasis should be apparent, although a minor amount of bleeding may be evident



Place formocresol blotted pellet (Buckley's solution - one-fifth dilution over pulp stumps for 5 minutes

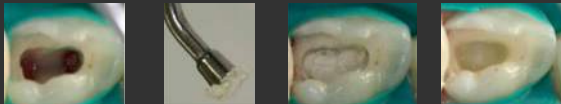
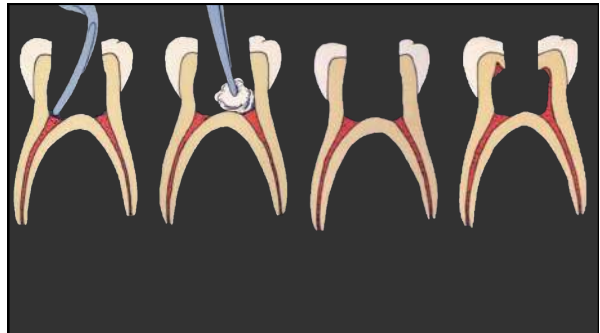
- When pellet removed, site will appear dark brown or dark red



Lightly condense ZOE/IRM over pulpal floor and fill chamber with alloy if temporizing



Place a SSC



Most authorities now agree that formocresol is at least potentially immunogenic and mutagenic. For these reasons, efforts have increased to find a substitute medicament.

Potential Substitutes for Formocresol

- ZOE
- Glutaraldehyde (GA)
- Ferric Sulfate
- SODIUM HYPOCHLORIDE
- Electrocautery
- Laser

No long-term controlled clinical studies are available to evaluate their success

Ferric Sulfate

- Hemostatic agent
- Clinical studies have been promising
- Fuks et al reported 93% success rate vs. 84% success rate for formocresol at 36 months

Examples of Successful Pulpotomies



Studies on formocresol pulpotomy of primary teeth and the occurrence of enamel defects on the permanent successor have found no effect.

Pulpotomy Failure

- Increased mobility, fistulous tract
 - Premature exfoliation
 - Radiographic evidence of interradicular/periapical radiolucency
 - Internal/external root resorption
- Caused by poor diagnosis and treatment selection

Pulpotomy Failures



Radical Treatment (Non-Vital)

Pulpectomy and Root Filling



Indicated in teeth that show evidence of chronic inflammation or necrosis in the radicular pulp

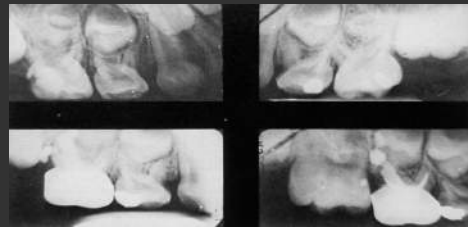


Ideal Indication

- is a case of pulp destruction of a **primary second molar** that occurs **before** the eruption of the permanent first molar, thus **avoiding a distal shoe space maintainer**



#1 Pulpectomy Indication



Pulpectomy Contraindications

- Tooth **not restorable**
- **Advanced** internal or external resorption
- Less than two-thirds of the primary root structure remaining
- Periapical infection involving the crypt of the succedaneous tooth

Root Canal Filling Materials

- ZOE
- Iodoform Paste (KRI)
- Calcium Hydroxide (Vitapex)
- Must be **resorbable**



Pulpectomy Technique

- Access similar to pulpotomy, but walls flared more
- Locate canal orifice of the roots
- Use broach to remove as much organic material as possible
- Endodontic files are selected and adjusted to stop **2 mm short of radiographic apex** of each canal

Pulpectomy Technique (Con' t.)

- Use files with sodium hypochlorite irrigation to remove as much organic tissue as possible
- Dry the canals with paper points
- Fill canals using a thin mixture of ZOE (without accelerators) using plunger technique or pressure syringe

STAINLESS STEEL CROWNS



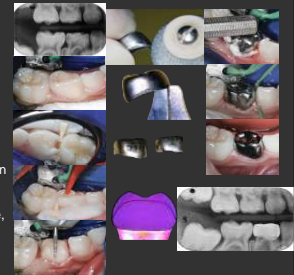
Stainless Steel Crowns (SSC)

Randall, 2000

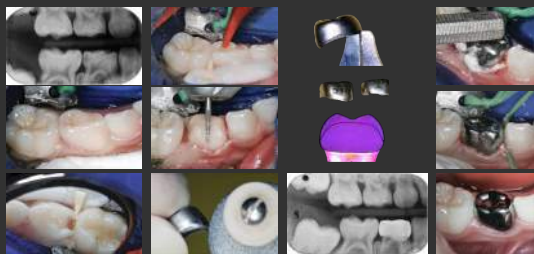
- % of failure of SSC: 1.9% a 30.3%
- % of failures of amalgams: 11.6% a 88.7%
- AMALGAMS:SSC FAILURE RATE 9:1.

Innes, 2007 COCHRANE

- None of the studies accomplished the inclusion criteria.
- This doesn't mean that SSC are not effective, although we need more information.



Stainless Steel Crowns (SSC)

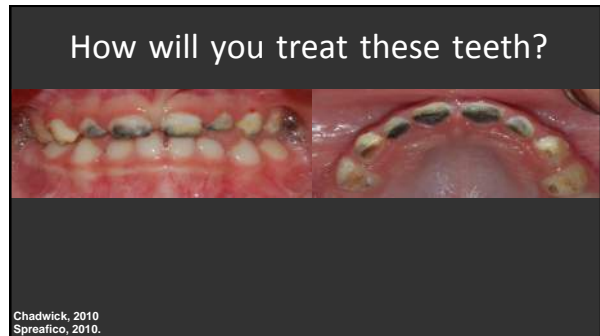
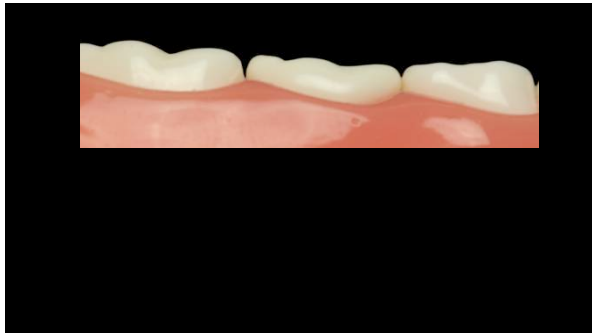


SSC SUCCESS

Messer y Levering, 1988

Durability (years)	years < 4 years	years > 4 years
1	92%	97%
5	76%	80%
10	64%	61%

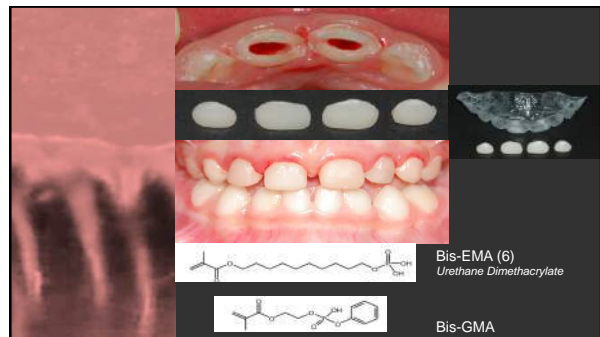
GENERAL SUCCESS 88%; Less success on teeth treated with pulpotomies.

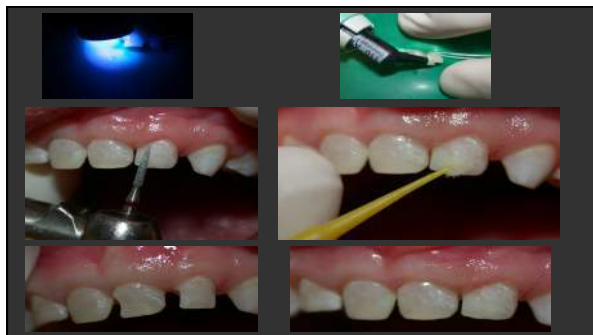
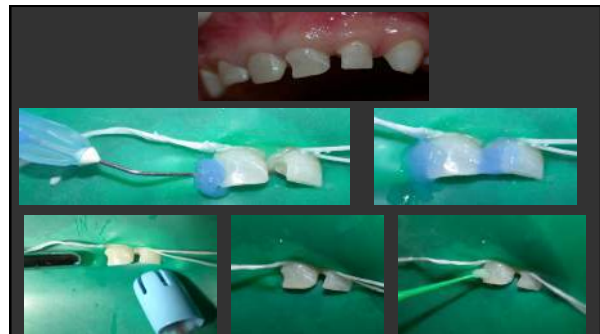


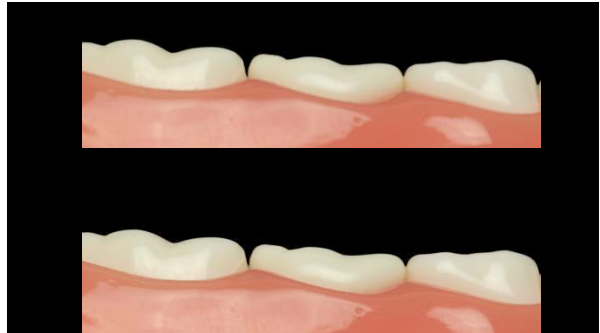
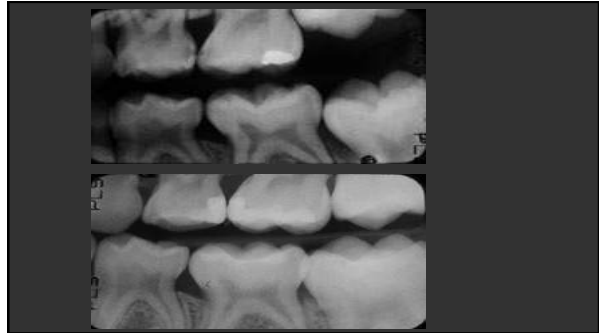
Chadwick, 2010
Spreafico, 2010.



Chadwick, 2010
Spreafico, 2010.







MTA vs Ca(OH)₂ Apexification

- El Meligy & Avery 2006
- Necrotic permanent teeth requiring root-end closure
 - 15 received MTA
 - 15 received Ca(OH)₂
- Recalled at 3, 6, and 12 months
- 2 Ca(OH)₂ failures at 6 & 12 months
 - Persistent periradicular inflammation
- **No MTA failures**

Pulpal Revascularization of Immature Necrotic Permanent Teeth

- Assumption:
 - apical portion of pulp may still be vital
- Goal:
 - **encourage this vital tissue to migrate coronally**
- Procedure:
 - disinfect root canal
 - place triple antibiotic paste (ciprofloxacin, metronidazole, cefaclor)

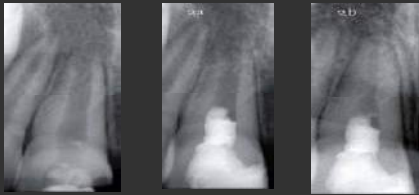
Pulpal Revascularization of Immature Necrotic Permanent Teeth

- Procedure, cont'd
 - remove paste after several weeks
 - induce bleeding by stimulating tissue beyond apex
 - allow clot to reach CEJ
 - cover with MTA, restore
- Resulting clot acts as scaffold to aid growth of new tissue in canal

Pulpal Revascularization of Immature Necrotic Permanent Teeth



Pulpal Revascularization of Immature Necrotic Permanent Teeth



Expect continued root lengthening and thickening
Pulp responsive to cold stimulus



RADIOGRAPHS AND SEALANTS

RADIOGRAPHS

- ### Should I take X-RAYS?
- The timing of the initial radiographic examination should not be based upon the patient's age, but upon each child's individual circumstances.
 - Radiographs should be taken only when there is an expectation that the diagnostic yield will affect patient care.

- ### RADIOGRAPHS
- PA's
 - Bitewings
 - Occlusals
 - Panoramic
 - Lateral Cephalometric
 - Frontal Cephalometric
 - Others



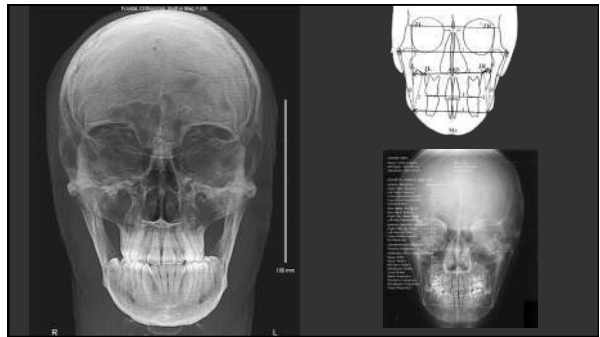
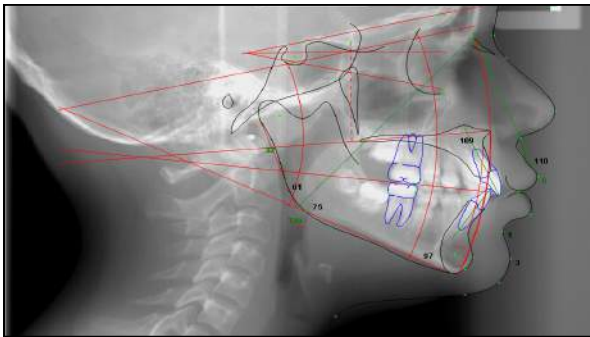
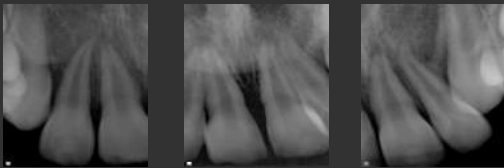
Occlusals



Panoramic



PA's Trauma Documentation



Guidelines for Prescribing Dental Radiographs

NEW PATIENT				
PRIMARY DENTITION (PRIOR TO ERUPTION OF THE 1ST PERMANENT TOOTH)	MIXED DENTITION (AFTER ERUPTION OF THE 1ST PERMANENT TOOTH)	ADOLESCENT WITH PERMANENT DENTITION (PRIOR ERUPTION OF THE 3RD MOLAR)	ADULT, DENTATE OR PARTIALLY EDENTULOUS	ADULT, EDENTULOUS
Individualized PA's / selected bitwings if proximal surfaces cannot be visualized or probed.	Individualized x-rays consisting of BW's and a PANORAMIC or selected PA's.	Individualized x-rays consisting of BW's and a PANORAMIC or selected PA's.	Individualized x-rays consisting of BW's and a PANORAMIC or selected PA's.	Individualized x-rays based on clinical signs and symptoms.
Patients without disease and with open contacts may not require x-rays at this time.		A full mouth intraoral X-rays if generalized dental disease or a history of extensive dental treatment.	A full mouth intraoral X-rays if generalized dental disease or a history of extensive dental treatment.	

American Academy of Pediatric Dentistry. Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs. 2015. Available at: "http://www.aapd.org/media/Polices_Guidelines/E_Radiographs.pdf" Accessed August 5, 2015.

Guidelines for Prescribing Dental Radiographs

RECALL				
PRIMARY DENTITION (PRIOR TO ERUPTION OF THE 1ST PERMANENT TOOTH)	MIXED DENTITION (AFTER ERUPTION OF THE 1ST PERMANENT TOOTH)	ADOLESCENT WITH PERMANENT DENTITION (PRIOR ERUPTION OF THE 3RD MOLAR)	ADULT, DENTATE OR PARTIALLY EDENTULOUS	ADULT, EDENTULOUS
Caries or at increased risk for caries.	BW's at 6-12 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 6-12 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 6-12 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 6-18 months intervals if proximal surfaces cannot be examined visual or with a probe.
No caries and not at increased risk for caries.	BW's at 12-24 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 12-24 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 18-36 months intervals if proximal surfaces cannot be examined visual or with a probe.	BW's at 24-36 months intervals if proximal surfaces cannot be examined visual or with a probe.

American Academy of Pediatric Dentistry. Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs. 2015. Available at: "http://www.aapd.org/media/Polices_Guidelines/E_Radiographs.pdf" Accessed August 5, 2015.

Guidelines for Prescribing Dental Radiographs

OTHER TREATMENT				
PRIMARY DENTITION (PRIOR TO ERUPTION OF THE 1ST PERMANENT TOOTH)	MIXED DENTITION (AFTER ERUPTION OF THE 1ST PERMANENT TOOTH)	ADOLESCENT WITH PERMANENT DENTITION (PRIOR ERUPTION OF THE 3RD MOLAR)	ADULT, DENTATE OR PARTIALLY EDENTULOUS	
Periodontal Disease	Judgment to decide in Imaging that may consist of, but is not limited to, selected BW's and/or PA's of areas where periodontal disease (other than nonspecific gingivitis) can be identified clinically.			
Growth & Development.	Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth and development.		Same info as primary and mix dentition plus assessment of the development of 3rd molars.	
Other circumstances: Implants, pathology, restorative/endo, perio and caries remineralization	Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring in these circumstances.			

American Academy of Pediatric Dentistry. Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs. 2015. Available at: "http://www.aapd.org/media/Polices_Guidelines/E_Radiographs.pdf" Accessed August 5, 2015.

Clinical situations for which radiographs may be indicated include but are not limited to:

1. Previous periodontal or endodontic treatment
2. History of pain or trauma
3. Familial history of dental anomalies
4. Postoperative evaluation of healing
5. Remineralization monitoring
6. Presence of implants or evaluation for implant placement
7. Positive Clinical Signs/Symptoms
8. Clinical evidence of periodontal disease
9. Large or deep restorations
10. Deep carious lesions
11. Malposed or clinically impacted teeth
12. Swelling
13. Evidence of dental/facial trauma
14. Mobility of teeth
15. Sinus tract ("Fistula")
16. Clinically suspected sinus pathology
17. Growth abnormalities
18. Oral involvement in known or suspected systemic disease
19. Positive neurologic findings in the head and neck
20. Evidence of foreign objects
21. Pain and/or dysfunction of the temporomandibular joint
22. Facial asymmetry
23. Abutment teeth for fixed or removable partial prosthesis
24. Unexplained bleeding
25. Unexplained sensitivity of teeth
26. Unusual eruption, spacing or impaction of teeth
27. Unusual tooth morphology, calcification or color
28. Unexplained absence of teeth
29. Clinical eruption

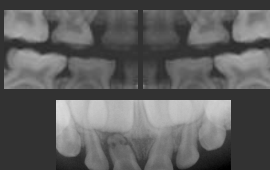
**** Factors increasing risk for caries may include but are not limited to:**

1. High level of caries experience or demineralization
2. History of recurrent caries
3. High levels of cariogenic bacteria
4. Existing restorations (of poor quality)
5. Poor oral hygiene
6. Inadequate fluoride exposure
7. Prolonged nursing (bottle or breast)
8. Frequent high sucrose content in diet
9. Poor family dental history
10. Developmental or acquired enamel defects
11. Developmental or acquired disability
12. Anoxia
13. Genetic abnormality of teeth
14. Many multisurface restorations
15. Chemotherapy therapy
16. Eating disorders
17. Drug/alcohol abuse
18. Inequitable dental care

Initial Exam

Without previous radiographs:

- **Primary Dentition:**
 - Bitewings, if we don't have a direct view.
- **Mix Dentition:**
 - Bitewings & Panoramic.
- **Permanent:**
 - 4 Bitewings.¹




American Academy of Pediatric Dentistry. Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs. 2015. Available at: "http://www.aapd.org/media/Polices_Guidelines/E_Radiographs.pdf" Accessed August 5, 2015.

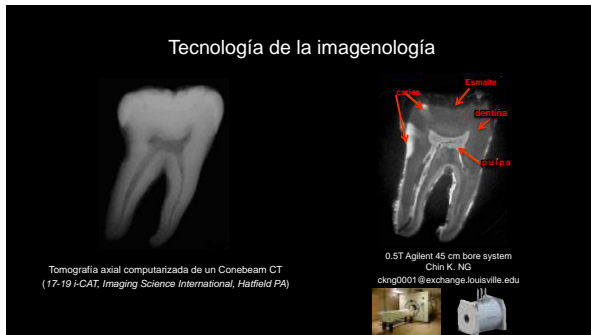
Recall patient.

With previous radiographs.

- **DMF's or High risk patients:**
 - Bitewings
 - Primary and Mix dentition every 6 months or until no evident caries.
 - Permanent every 6 or 12 months.
- **No DMF's or low risk patients:**
 - Bitewings
 - Primary and Mix dentition every 12-24 months.
 - Permanent every 18 or 24 meses.
- **Periodontal disease:**
 - Complete series of PA's and BW's



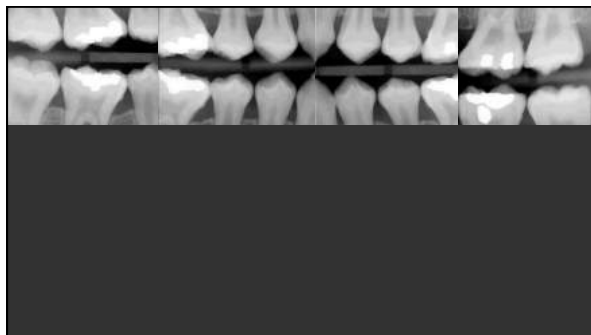
American Academy of Pediatric Dentistry. Guideline on Prescribing Dental Radiographs for Infants, Children, Adolescents, and Persons with Special Health Care Needs. 2015. Available at: "http://www.aapd.org/media/Polices_Guidelines/E_Radiographs.pdf" Accessed August 5, 2015.



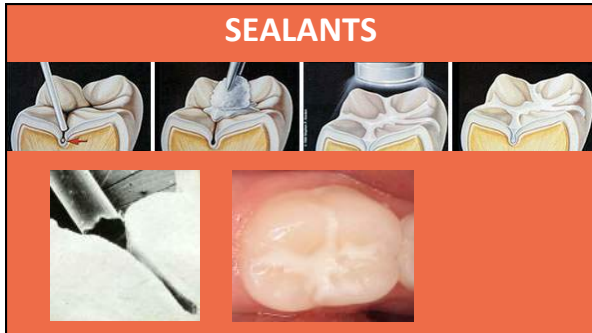
PRECAUTIONS

- Every precaution should be taken to minimize radiation exposure, protective thyroid collars and aprons should be used whenever possible. This practice is strongly recommended for children, women of childbearing age, and pregnant women.”

American Dental Association, US Dept of Health and Human Services. The selection of patients for dental radiograph examinations- 2006. Available at: http://www.ada.org/Content/Publications/PDF/Topics_radiography_examselect0611.pdf Accessed June 23, 2012



SEALANTS



SEALANTS

Simonsen 1991 (15 years)

PERMANENT MOLARS	Group with sealants	Group without sealants
Sound enamel	68.8% (88)	17.2% (22)
Teeth with caries or Tx	31.3% (40)	82.8% (106)
Total of surfaces	100% (128)	100% (128)

ALL TEETH	5 years	10 years	15 years
Retención total	82% (173)	57% (131)	27% (53)
Retención parcial	11% (23)	21% (48)	36% (68)
Ausente	0.5% (1)	7% (16)	11% (21)
Cariado	7% (14)	16% (36)	26%(50)

SEALANTS

Heller 1995 (5 YEARS)

- **SOUND (NO CARIES)**
 - NO SEALANT- 13% caries
 - YES SEALANT- 8% caries
- **Incipient Caries or in doubt**
 - NO SEALANT- 52% caries
 - YES SEALANT- 11% caries



SEALANTS

1. Autocure, Photocure Resins with/without filler
1. Change of color
2. autoetch/Acid etch/air abrasion Feigal, 2000
3. Fluoride delivery

Aho-vuori-Saloranta A, Hirri A, Nordblad A, Worthington H, Mäkelä M. Pit and fissure sealants for preventing dental decay in the permanent teeth of children and adolescents. Cochrane Database Syst Rev. 2004;(3):CD001830.

GIC-SEALANTS

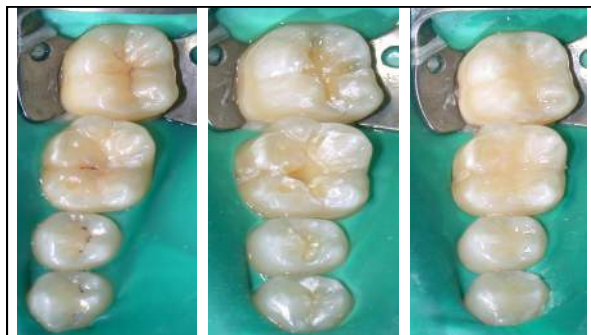
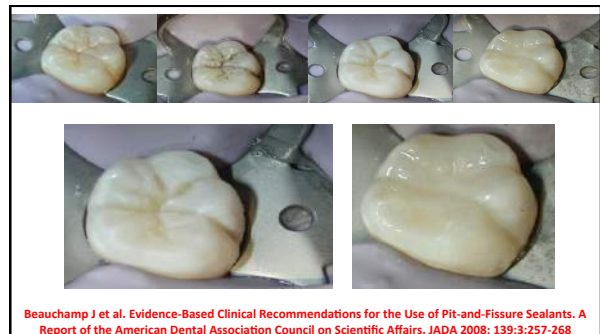
Antonson 2012

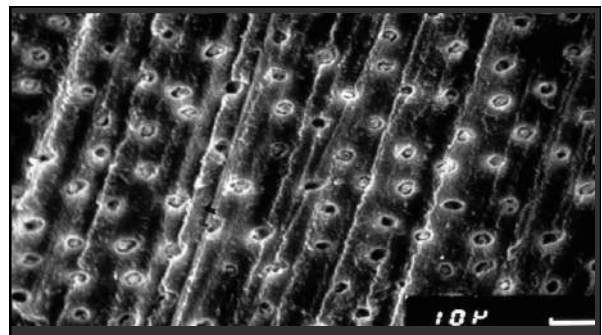
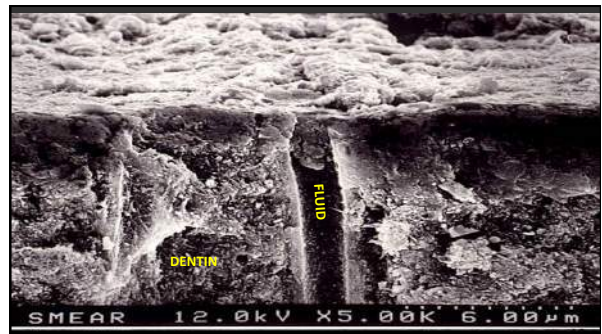
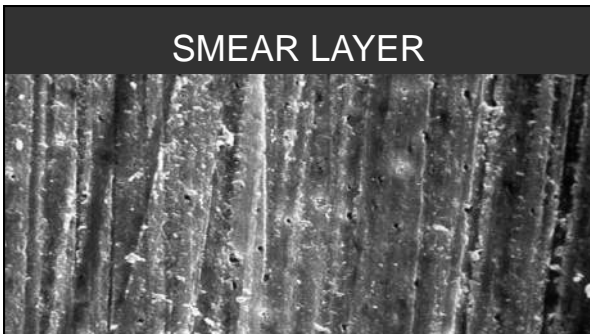
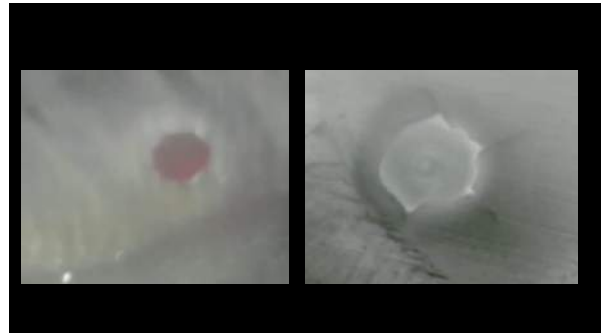
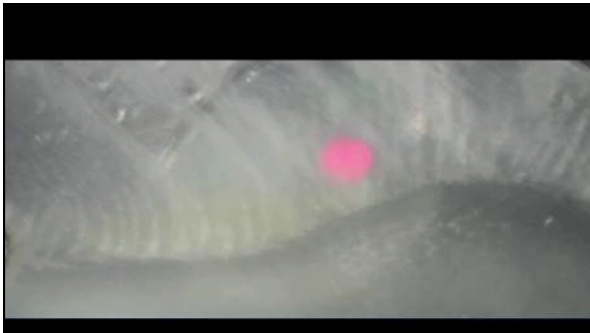


*DISTO-OCCLUSO-BUCCAL /LINGUAL -AAPD Reference Manual-2015.

SEALANTS


- Fissurotomy
 - High speed vs slow speed
 - Diamond vs carbide
- LASER
- Air abrasion





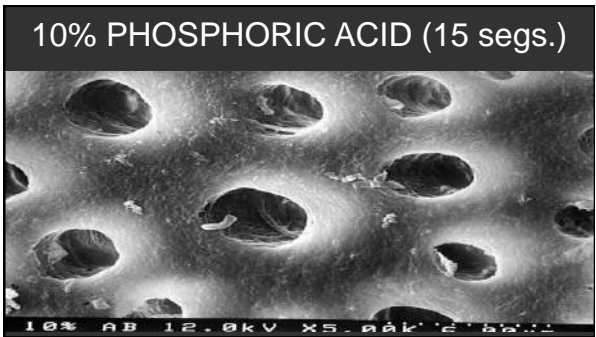
DENTAL MATERIALS-ACID ETCH

1. Redford 1986
 - 10% AF



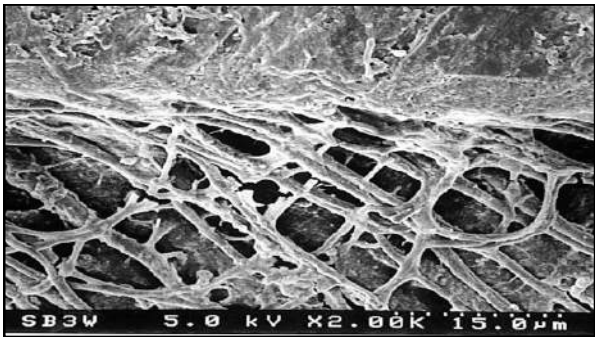
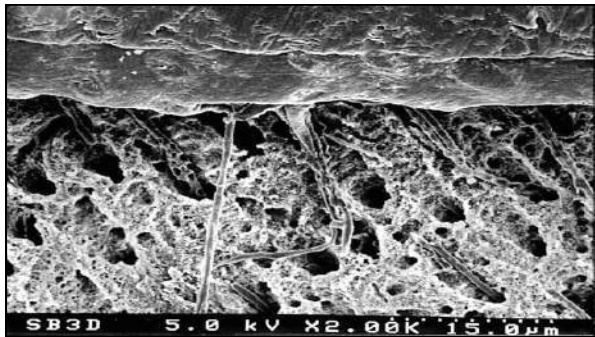
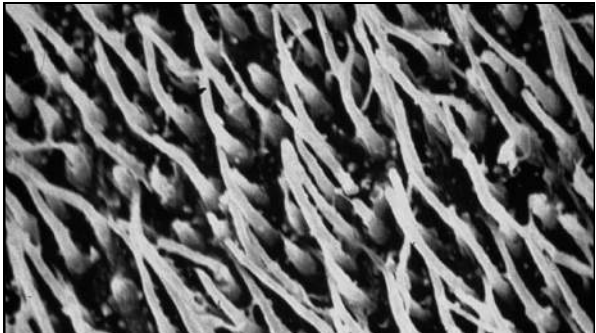
	ETCHING TIME			
	15s	30s	60s	120s
Media (micrones)	9	12	14	50

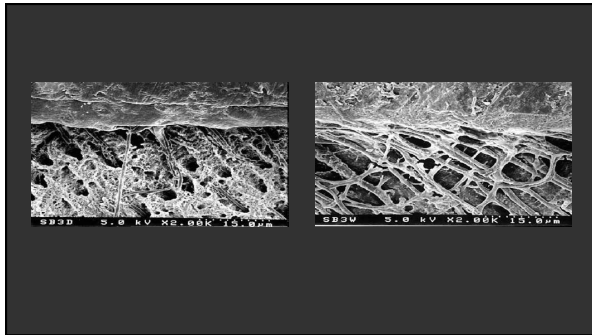
Hitt and Feigal, 1992 (Pediatr Dent)
 Feigal et al., 1993 (JADA)
 Feigal et al., 2000 (J Dent Res)



PRIMER (Methacrylate)

- Dehydrating agents
 - Aldehyde
 - Acetone
 - Alcohol







Deferred Treatment

- Risks/Benefits must be explained
- ART/Interim Therapeutic Restoration and regimented application of fluoride varnish

Advanced Behavior Guidance

- Protective stabilization
- Sedation
- General Anesthesia

Basic Behavior Guidance

- Communicative
 - Distraction
 - Tell-Show-Do
 - Nonverbal
 - Positive Reinforcement
 - Voice Control
- Parental Presence/Absence
- Nitrous Oxide considered as a basic behavior guidance, when anxiolytic/analgesic levels are used ACRO Ref Manual, 2008-10

Acs, 2001
Adair, 2007
Casamassimo et al., 2002
Crossley & Joshi, 2002

Nitrous Oxide-Oxygen Inhalation Sedation

Nitrous Oxide

- Inhalational
- Mechanism: gas is absorbed rapidly (2-3 minutes)
 - From alveoli and is held in solution in the serum for distribution into tissues and cells of CNS
- Effects: Anxiolysis/Analgesia
 - Anxiolytic effect
 - activation of the GABAA receptor through the benzodiazepine binding site
 - Analgesic effect
 - initiated by neuron release of endogenous opioid peptides
 - activation of opioid receptors, GABAA receptors, noradrenergic pathways
 - Mild CNS depression
 - Maintenance of blood pressure:
 - only minor depression of cardiac output w/slight increase in peripheral resistance

Pre-procedural Considerations Nitrous Oxide

- Equipment
 - Appropriately fitting nasal hood
 - Must be capable of delivering 100% and never less than 30% oxygen – failsafe mechanism
 - Does not allow nitrous to flow without oxygen
 - Fail-safe mechanism that is checked and calibrated regularly (document calibration)
 - Must have a scavenging system
 - Emergency cart
 - Positive pressure oxygen delivery system
 - E cylinder, capable of delivering 90% oxygen at 10L/min for 60 minutes
 - Self-inflating bag-valve-mask device which delivers 15L/min

Pre-procedural Considerations Nitrous Oxide

- Personnel and training
 - Must be administered by licensed individuals
 - Personnel must have appropriate training and certification in CPR
 - Periodic reviews of office emergency protocol

Pre-procedural Considerations N2O

Administration of nitrous oxide

- Must be administered by licensed individual
- Flow rate of 5-6L/min
- 100% oxygen for first 1-2 minutes
- Titrate nitrous oxide to maximum of 50%
- Continue with communicative techniques, patient become highly suggestible
- Can titrate dose down at subsequent visits, large placebo effect
- Nausea increased by
 - Longer administration of nitrous oxide
 - Frequent fluctuations of nitrous oxide
 - Higher concentrations of nitrous oxide



Pre-procedural Considerations Nitrous Oxide

- Administration of Nitrous Oxide
 - If child appears restless
 - May be ready to vomit
 - May be entering into deeper level of sedation
 - Use lowest level of nitrous oxide that produces desired response
 - Clinical observation of patient before, during procedure – assessed by spoken responses to commands
 - If other pharmacologic agent is used (other than local anesthetic) use monitoring consistent with that required for appropriate level of sedation
 - Use of nitrous oxide > 60% may cause moderate to deep sedation
 - 100% oxygen for 3-5 minutes after discontinuing nitrous oxide
 - Document
 - Percent nitrous oxide used
 - Duration of procedure
 - Post-treatment oxygenation
 - Patient response to nitrous oxide

Nitrous Oxide-Advantages

- Rapid onset and recovery time
- Ease of titration – especially in a calm patient
- Lack of serious side effects – excellent safety record
- Can be used with communicative behavior guidance techniques
 - Dentist's behavior major influence
 - Communicative techniques more effective with nitrous oxide

Weinstein, 1986

Nitrous Oxide-Disadvantages

- Weak agent
- Depends on patient acceptance
- Patient must be able to breath through nose
- Occupational hazards
 - May increase risk of miscarriage greater in dental personnel with prolonged exposure AND no scavenging system Rowland et al., 1995
 - May potentiate effects of other sedatives to a dangerous degree
 - In high doses may cause nausea or excitement
 - 1-10% of patients
 - Diffusion hypoxia may occur if insufficient oxygenation at end of procedure: rapid release of nitrous oxide from blood stream into alveoli, diluting concentration of oxygen
 - Headache, disorientation

Nitrous Oxide

- Indications
 - Mild to moderate fear or patient
 - Certain mentally, physically, or medically **compromised patients**
 - Patient with exaggerated **gag reflex**
 - Cooperative patient undergoing a **lengthy dental procedure**
 - Patient with **difficulty achieving local anesthesia**
- Contraindications
 - **Chronic obstructive pulmonary disease**

Nitrous Oxide

- Caution – Medical consultation indicated
 - Acute otitis media
 - Severe asthma
 - Sickle cell disease – **has been shown to cause neuropathy**
- Ogundipe et al., 1999
- Bleomycin sulfate therapy (anti-neoplastic antibiotic) – oxygen administration can lead to interstitial pneumonitis which can be fatal
- Fleming, 1988

Nitrous oxide used with other pharmacologic agents

- Increases sedative effect – deepens level of sedation
 - Chloral hydrate – also increases respiratory depression effect
 - Diazepam
 - Midazolam

Wilson, 1998
Litman, 1998
Haupt, 1996
Litman, 1997

Advanced Behavior Guidance

- Documentation
 - Consent
 - Type of stabilization used and why
 - Length of time stabilization used for patient
 - Effectiveness of stabilization

- **Levels of sedation**
 - Patient can move from one level to another without warning
 - Defined by patient’s responsiveness and physiologic changes
 - Monitoring requirements increase as level of sedation increases
- **Monitoring**
 - Clinical level of consciousness
 - Responsiveness
 - Conversation
 - Body movement
 - Eyes open or closed

Monitors during sedation

- Observation of patient
- Pulse oximeter
- Capnograph
- Pre-cordial stethoscope
- Blood pressure
- EKG
- Temperature

Monitor	Advantages	Limitations
Pulse oximeter	• Reliable	• Not a "gold standard" measure
	• Non-invasive	• Altered readings
	• Affordable	• Dislodgement of sensor critical to accuracy of reading
	• Alerts for low O ₂ saturation	• Sensor motion (light leak) may cause reading
	• Continuous monitoring of each patient	• Hypothermia affects reading
	• Considered "gold standard" in clinical practice	• Absorbance affects reading
Capnograph	• Real-time measure	• Expensive
	• Reliable	• There are prone to dislodgement
	• Non-invasive	• There may occlude against
	• Good indicator of patient level of oxygen level	• None
	• Alerts for oxygen saturation	• There may be too far away from teeth
	• Respiratory rate measured	• Inspired air may be drawn through the oral cavity

Breath Sound	Interpretation
Stridor	Airway blockage by tongue/ soft tissues
Coughing	Fluids in the airway secretions
Whistling	Bronchospasm
Obstructed	Not patient position
No breath sounds	Complete laryngospasm Complete bronchospasm Complete obstruction

Sedation

Considerations for Sedation

- Familiarity with current guidelines for sedation: State Boards of Medicine & Dentistry are the ultimate determinants
- Careful patient selection
- Choose type of drug based on type/length of procedure
- Select lowest dose of drug with highest therapeutic index for the procedure
- Knowledge about drugs being used
 - Time of onset
 - Peak response time
 - Duration of action
- Informed consent
- Pre-operative instructions, including diet
 - Clear liquids up to 2 hours pre-op
 - Breast milk up to 4 hours pre-op
 - Infant formula up to 6 hours pre-op
 - Non-human milk up to 6 hours pre-op
 - Light solid food up to 6 hours pre-op

- Responsible person must be available for transport of patient – preferably 2 individuals
- Monitoring appropriate to level of sedation, based on guidelines
- Emergency preparedness, including EMS back-up
- Documentation – pre-op, during, and post-op

	Minimal	Moderate	Deep
Goal	<ul style="list-style-type: none"> Decrease anxiety Facilitate coping 	<ul style="list-style-type: none"> Decrease anxiety Facilitate coping 	<ul style="list-style-type: none"> Eliminate anxiety Override coping skills
Patient responsiveness	<ul style="list-style-type: none"> More calm Interactive Aware of but less responsive to clinical stimuli 	<ul style="list-style-type: none"> More calm Interactive Aware of but less responsive to clinical stimuli 	<ul style="list-style-type: none"> Uneasily aroused Noninteractive Unaware of and minimally responsive to clinical stimuli
Physiologic Changes	<ul style="list-style-type: none"> No loss of protective reflexes Normal vital signs 	<ul style="list-style-type: none"> No loss of protective reflexes Normal vital signs 	<ul style="list-style-type: none"> Partial or complete loss of protective reflexes Stable and minimally or moderately below health status norms
Personnel needed	2	2	3

Sedation

- Patient selection**
 - ASA I and II – generally appropriate for sedation
 - ASA III and IV, special needs, airway abnormalities, increased tonsil size – get consults as indicated; sedation may be contraindicated in these patients. Consider for possible GA where airway, medical condition can be best monitored
- Patient assessment
 - Medical history-birth to present
 - Any current illness
 - Chronic conditions
 - Physical assessment
 - Cardiovascular
 - Respiratory: Airway development and health
 - Wheezing common finding in children 0-3 yrs
 - Wheezing related to history of respiratory syncytial virus (RSV) in infancy
 - 30% of patients with RSV history in infancy have recurrent lower respiratory infections or wheezing 6-8 yrs after initial infection

Panitch, 2007

Sedation

Tonsil size:

Brodsky Scale: 0 to +4

- 0 means the tonsil is in the fossa
- +1 means less than 25% obstruction
- +2 is less than 50%
- +3 is less than 75%
- +4 is more than 75% obstruction

Brodsky et al., 1987

Patient selection - sedation

- Mallampati classification – size of airway
 - Class I** – visualization of soft palate, fauces, uvula, anterior and posterior pillars
 - Class II** – visualization of soft palate, fauces and uvula
 - Class III** - visualization of soft palate and base of uvula
 - Class IV**- soft palate not visible

Mallampati, 1985

Patient selection - sedation

- Snoring
- Gag reflex
- Current medications, including herbal
 - Some medications can increase duration of action of sedative medications
 - Behavioral assessment

Poor candidates for sedation

- Sleep apnea
- Obesity – greater risk for aspiration, especially with BMI of 85th percent or higher
- Increased neck circumference – associated with adverse respiratory events
 - Baker & Yagelski, 2006 Cook-Sather et al., 2009 Naitu et al., 2011 Kang et al., 2012
- Abnormal airway – tongue, tonsils
- In sedated children with large tonsils, head rolling forward causes significant airway obstruction
 - Fishbaugh, Wilson, et al., 1997
- Chronic conditions
 - Moderate to severe asthma
 - Liver or renal disease
 - Poorly controlled seizures
 - Patients at risk for aspiration: CP, GERD

Sedation

- **Child's airway is challenging**
 - Different anatomy increases risk of airway problems
 - Narrow trachea, narrow glottis, narrow nasal passages
 - Relatively larger tongue/epiglottis
 - Mandible less developed
 - Increased airway resistance
 - Baker & Parico, 2010
- Monitoring airway
 - Head position
 - Snoring
 - Patient color
 - Chest movement
 - Use rubber dam to protect airway

Sedation-Respiratory System

- Ventilation: air movement into/out of lungs
 - Higher respiratory rate in children
 - Smaller tidal volume in children
- Oxygenation: oxygen delivered to tissues (brain)
 - Requires patent airway
 - Transport across alveoli
 - Hb transport of oxygen
 - Transport via cardiovascular system
 - Metabolic tissue exchange: oxygen-carbon dioxide
 - Elimination of carbon dioxide

Cardiovascular system

- **Heart rate**
 - Normal: 4 yo = 100 beats/min.
 - Normal: 10 yo = 90 beats/min.
- Child's blood pressure totally dependent on heart rate
- Drop in heart rate leads to hypotension
- Hypotension in a child signifies decreased heart rate and should be taken very seriously
- Monitoring cardiovascular status
 - Blood pressure
 - Cuff should be 2/3 upper arm length
 - Too small – high reading; too large – low reading
 - **Pulse oximeter**
 - Pulse palpation – closest to heart is best

Routes of administration – general considerations

- Oral
 - Most common route
 - Easily accepted – no injections
 - Prolonged onset and recovery
 - Relatively safe if only using one drug
 - Using combinations of drugs increases risk of adverse outcomes – Less predictable
 - First pass hepatic metabolism leads to low bioavailability
 - Inability to titrate
- Intranasal
 - Rapid onset
 - Nasal mucosa links to CNS
 - Plasma levels similar to IV
 - Use atomizer: 1cc syringe
 - 1/2 dose per nostril
 - Inability to titrate
 - Use lower dose – no first-pass metabolism
 - Indicated for patient who refuses oral meds
 - Patients find administration unpleasant

Routes of administration – general considerations

- Intramuscular
 - Faster absorption than oral route
 - Ease of administration – no taste issues
 - Potential for trauma to injection site
 - Prolonged onset and recovery
 - Inability to titrate
 - Painful
 - Increased liability costs
- Intravenous
 - Optimum route
 - Rapid onset
 - Drug can be titrated to achieve desired effect
 - Absorption not a factor
 - Drug can be administered in small amounts over time
 - IV access is available in case of emergency
 - Difficulty in starting IV in difficult/obese patients
 - Venipuncture complications – hematoma
 - Requires highest level of monitoring
 - Increased liability costs

Local anesthetic agents

- Amides: Lidocaine, mepivacaine, articaine, prilocaine, bupivacaine
- Esters: Procaine
- Contraindications
 - True allergy: if amide choose another amide; if ester cannot use another ester
 - Bisulfite preservative use in LA w/vasoconstrictor: if allergic to bisulfite use LA without vasoconstrictor

Local anesthetic agents-Lidocaine (xylocaine)

- amide anesthetic
- Maximum dose: 4 mg/kg with or without vasoconstrictor
- Prior to procedure, calculate and record maximum dose for patient
- Soft tissue anesthesia onset – 5 minutes
- Minimal CV effect
- CNS depression

Local anesthetic agents-Septocaine (Articaine)

- 4% concentration
- Has not been studied in patients < 4yrs.
- Max. dose 7 mg/kg
- CNS, CV, Immune effects

Local anesthetic agents

- LA Complications
 - Toxicity can occur with inadvertent intravascular injection
 - CNS Toxicity
 - Excitation – dizziness, confusion, twitching, seizure activity
 - Depression – loss of consciousness, arrest
 - CVS Toxicity
 - Stimulation - increased HR, increased BP
 - Depression - bradycardia, arrest
 - Paresthesia: nerve trauma, hemorrhage around nerve, neurotoxicity
 - Risk w/ 2% LA: 1:1,200,000
 - Risk w/ 4% LA (e.g. articaine): 1:500,000, especially with trigeminal nerve block
- Hillerup et al., 2011

Local anesthetic agents

- Soft tissue trauma
 - Prevention
 - Oraverse (Phentolamine mesylate)
 - non-selective alpha-adrenergic blocking agent; vasodilator
 - given at injection site
 - decreases recovery time by 40-50% (60 minutes vs. 125 minutes)
 - according to manufacturer (Novocol for Septodont), not recommended for use in children less than 6 yrs. of age
- Hersh et al., 2008
Tavares et al., 2008
- Overdose of LA appears as seizure
 - When used with sedatives, local anesthetics can potentiate CNS effects of sedatives
 - Seizure threshold is decreased

- ## Local anesthetic agents
- Using drugs in combination
 - Benefit: use different pharmacologic effects of each drug
 - Combined techniques – use of oral and inhalation, e.g.
 - Dosage considerations – use lower dosage due to potentiation
 - Deeper sedation may result – be prepared

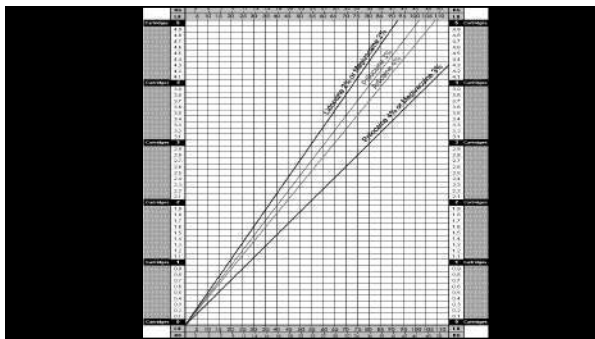


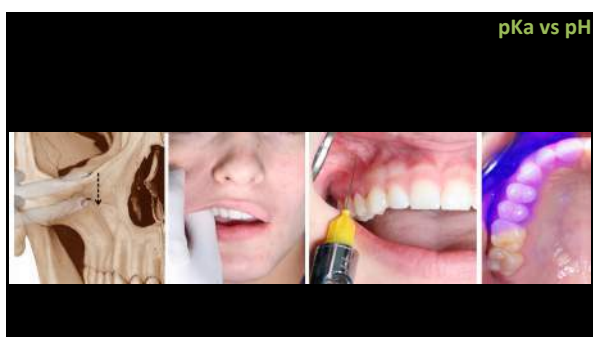
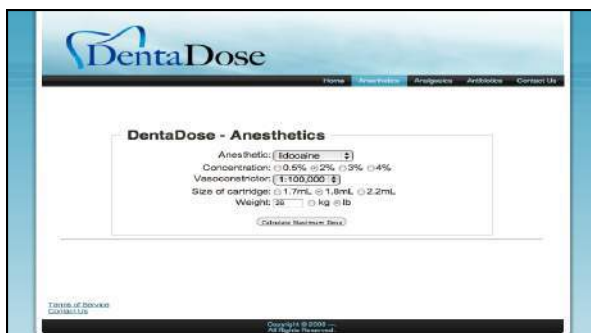
Martinez HR. Short communication: Graph for calculating maximum local analgesic dose in millilitres for the paediatric population. Eur Arch Paediatr Dent 2009;10(1):40-2. PMID: 19663896 [PubMed - indexed for MEDLINE]

Anesthetic	mg/mL	mg/kg	mg/lb	Max total dose (mg)
Amplidone, F.D.		4.40	2.00	300
2% plain	20			
2%+1:50,000 epinephrine	20			
2%+1:100,000 epinephrine	20			
Dento-ain		4.40	2.00	300
3% plain	30			
2%+1:100,000 epinephrine	20			
2%+1:20,000 levonordefrin	20			
Tiducaine		7.00	3.20	500
4%+1:100,000 epinephrine	40			
4%+1:200,000 epinephrine	40			
		6.00	2.70	400
4% plain	40			
4%+1:200,000 epinephrine	40			
3%+1:200,000 epinephrine	30			
		1.30	0.60	90
0.5%+1:200,000 epinephrine	5			

Patients Weight	Max dosage/kg or lb	Max dosage for patients
34	1.3	44.2
Kg or lb	mg/kg or mg/lb	mg
Anesthetic Percentage	Cartridge (mL)	Anesthetic per Cartridge
20	1.8	36
mg/mL	1.7 or 1.8 mL	mL
Max dosage for patients	Anesthetic per Cartridge	Max cartridge for patient
44.2	36	1.2
mg	mL	cartridges

Hosler and Marquis, 2009
Lundberg and Zornes, 1999
Hosler, 2002





pKa vs pH

Why nitrous oxide

- Fear of an unpleasant experience, namely pain.
- Nitrous oxide relieves both the physiological and the psychological aspects of pain.

- 65% of general dentist and almost 90% of pediatric dentists use nitrous oxide in their offices.

Rationale for inhalation sedation

- The use of inhalation sedation with nitrous oxide (N₂O) and oxygen (O₂) has many significant advantages over other methods of pharmacosedation

- Even in the presence of more potent agents, nitrous oxide is an excellent adjunct due to its **low lipid solubility** and as a result excellent ability to titrate.

Advantages of Inhalation Sedation (N2O-O2)

1.- Onset of Action

- The onset of action of inhalation sedation is more rapid than that of oral, rectal and intramuscular sedation. IV sedation onset is roughly equal to inhalation.

Route of administration	Onset of action
Oral	30 minutes
Rectal	30 minutes
IM	10 to 15 minutes
IV	20 seconds (arm-brain circulation), 1-3 minutes for clinical action.
Inhalation	<20 seconds (pulmonary to brain), 2 to 3 minutes for clinical action.

Advantages of Inhalation Sedation (N2O-O2)

2.- Peak Clinical Effect

- Peak clinical actions do not develop for most oral, rectal and IM drugs for a period of time that makes titration absolutely impossible.

- Only i... de peak clinical

Route of administration	Onset of action
Oral	60 minutes
Rectal	60 minutes
IM	30minutes
IV	60 seconds to 20minutes.
Inhalation	3 to 5 minutes.

Advantages of Inhalation Sedation (N2O-O2)

3.- Alteration of Depth of Sedation

- The depth of sedation achieved with inhalation sedation may be altered from moment to moment.
- With no other sedation technique does the administrator have as much control over the clinical action of a drug.

The degree of control represents a significant safety feature of inhalation sedation.

Route	Ease to Lighten	Ease to Deepen
Oral	NO	NO
Rectal	NO	NO
IM	NO	NO
IV	DEPENDS	YES
Inhalation	YES	YES

Advantages of Inhalation Sedation (N2O-O2)

4.- Duration of Action

- Duration of action is an important consideration selection of sedation technique

Route of administration	Onset of action
Oral	Fixed Duration
Rectal	Fixed Duration
IM	Fixed Duration, variation by drug
IV	Fixed Duration, variation by drug
Inhalation	Variable, as discretion of administrator

Advantages of Inhalation Sedation (N2O-O2)

5.- Recovery Time

- Recovery time from inhalation sedation is rapid and is the most complete of any technique.

N2O is not metabolized by the body, the gas is rapidly and virtually completely eliminated from the body within 3 to 5 minutes. In all other techniques the recovery from sedation is considerably slower.

Route of administration	Recovery Time
Oral	> 2 to 3 hours
Rectal	> 2 to 3 hours
IM	> 2 to 3 hours
IV	> 2 to 3 hours
Inhalation	Usually Complete 3 to 5 minutes after 100% O2

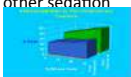
Advantages of Inhalation Sedation (N2O-O2)

6.- Ability to Titrate

- Titration is the ability to administer small incremental doses of a drug until desired clinical action is obtained. Ability to titrate represents the greatest safety feature a technique can possess.

Significant drug overdose will not develop in techniques in which titration is possible, as long as the practitioner titrates the drug used.

Intravenous & inhalation Sedation allow for titration. No other sedation technique is capable of titration.



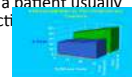
Advantages of Inhalation Sedation (N2O-O2)

7.- Ability to Titrate

- In the outpatient setting it is in everyone's best interest that the patient is discharged from the office with no prohibitions on their activities.

Drug administered for the reduction of fear & anxiety are CNS depressants. A patient must have an escort for a number of hours following administration of these drugs.

Inhalation sedation recovery is almost always complete, a patient usually may be discharged from the office alone, with no restrictions.

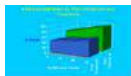


Advantages of Inhalation Sedation (N2O-O2)

7.- No injection required

8.- Safe, very few side effects

9.- N2O-O2 has no adverse effects on the liver, kidneys, brain, or cardiovascular & respiratory system.



Disadvantages of Inhalation Sedation (N2O-O2)

7.- No injection required

8.- Safe, very few side effects

9.- N2O-O2 has no adverse effects on the liver, kidneys, brain, or cardiovascular & respiratory system.

