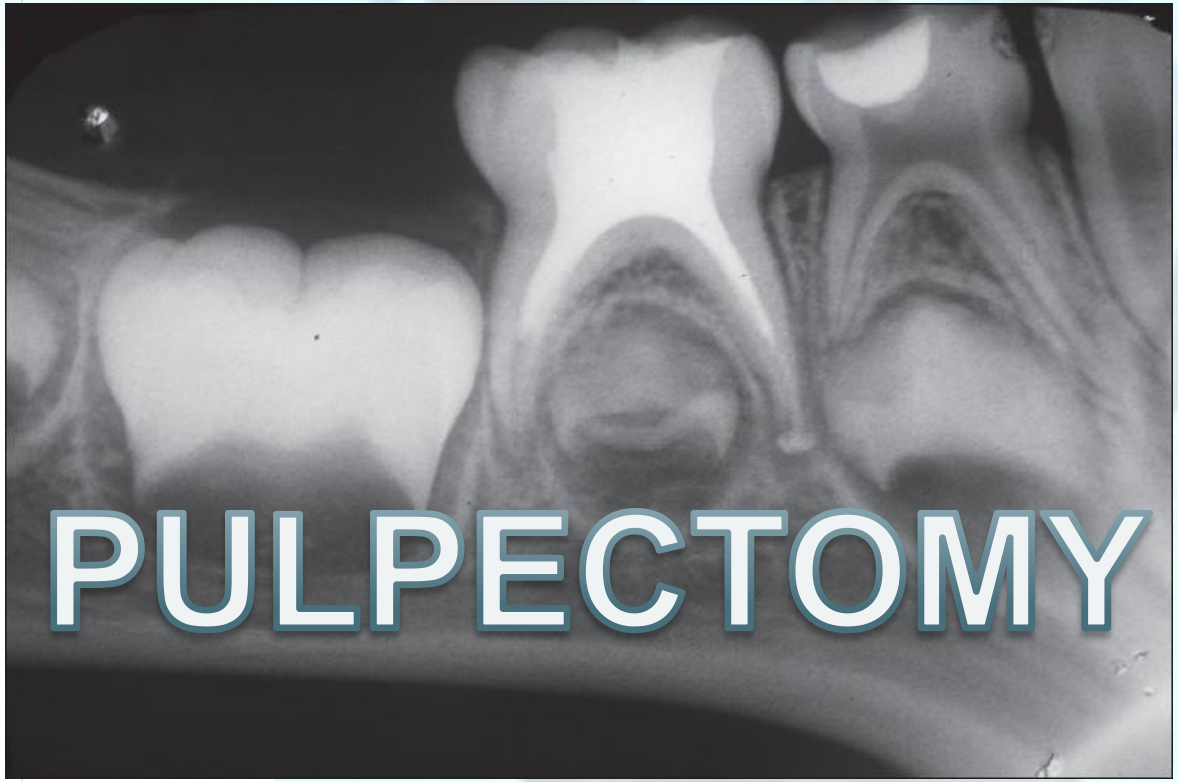
Non-vital pulp therapy in pediatric dentistry



Dr. Shanmugavadivel, Professor
Department of Pedodontics and preventive dentistry

CONTENTS

- Definition
- Introduction- Importance and its goal
- Rationale & objectives
- Indications & Contraindications-AAPD
- Primary teeth vs Permanent teeth ????- Uniqueness of primary teeth
- Treatment considerations
- Endodontic triad

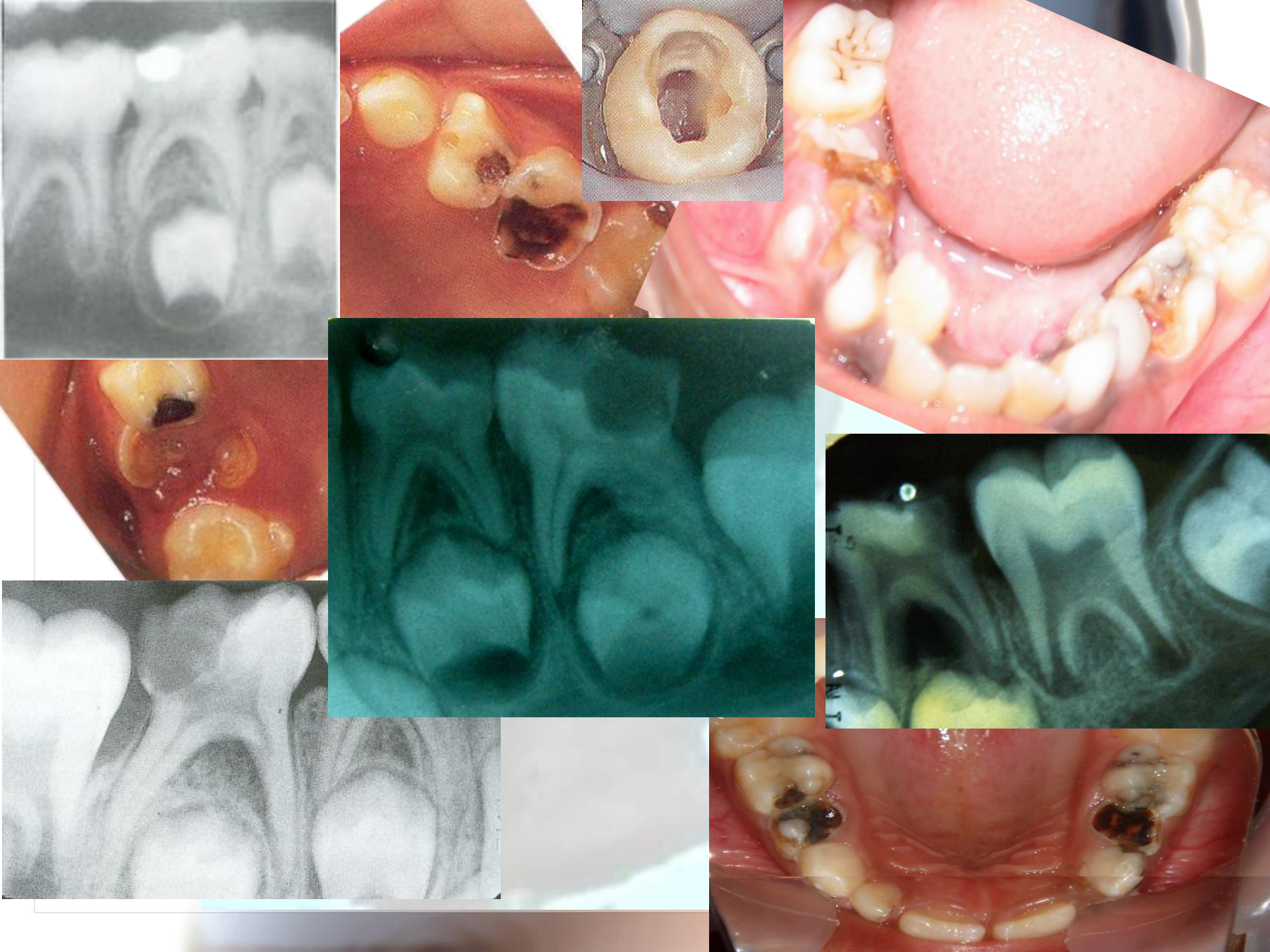
- Acess cavity preparation
- Exploration
- Extripation of pulp
- WL determination
- Cleaning and shaping-Endodontic instuments

Rotary endodontics in pediatric dentistry

- Root canal irrigants
- Obturation –Materials used for obturation
- Obturation techniques

- Types of pulpectomy- single visit, multi-visit, laser
- Success criteria for pulpectomy
- Pulpectomy –a controversy
- Limitations
- Complications

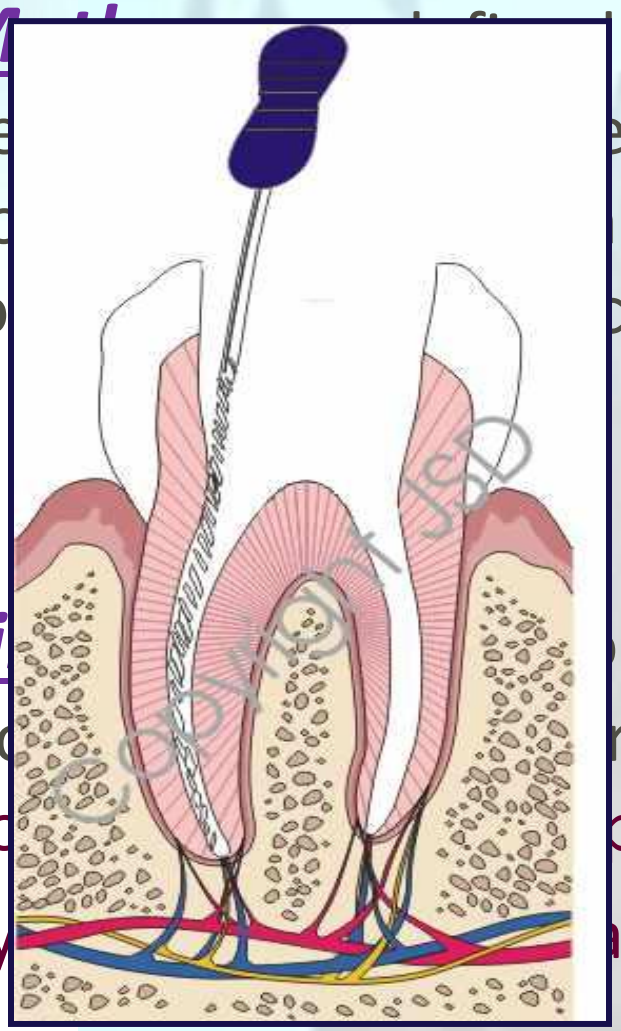
- Conclusion
- References

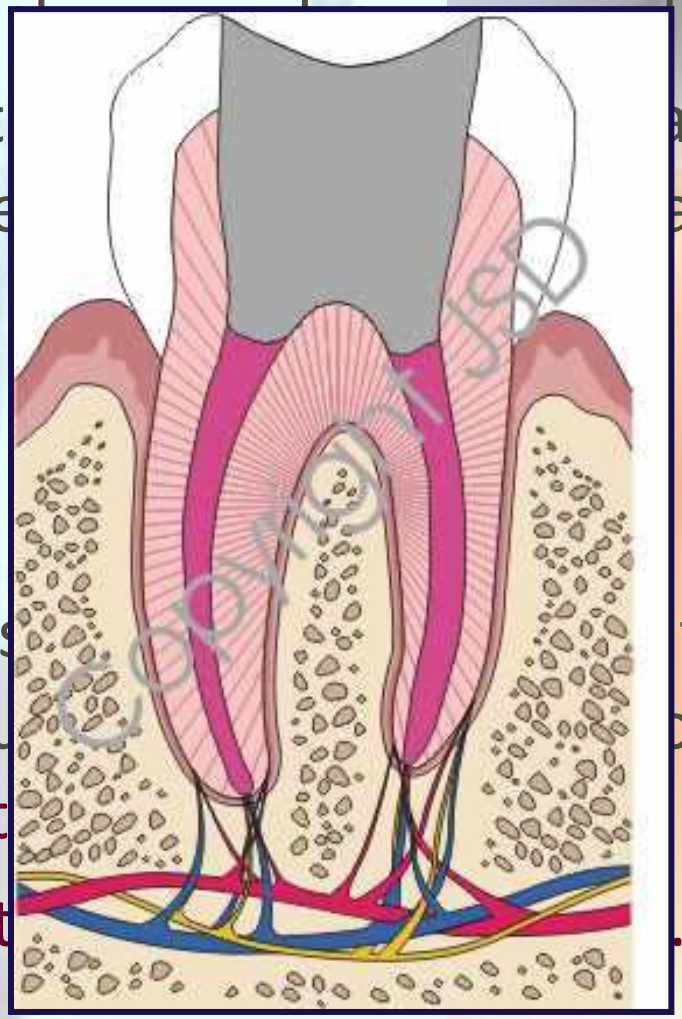


DEFINITION

- ***M*** it as of
  ne root
  po ary te ain a
  to ch.

- ***Fi*** my as tissue
  fr radicu oth .
  Co ulp t
  by ls wit .





- ***AAPD -2014***

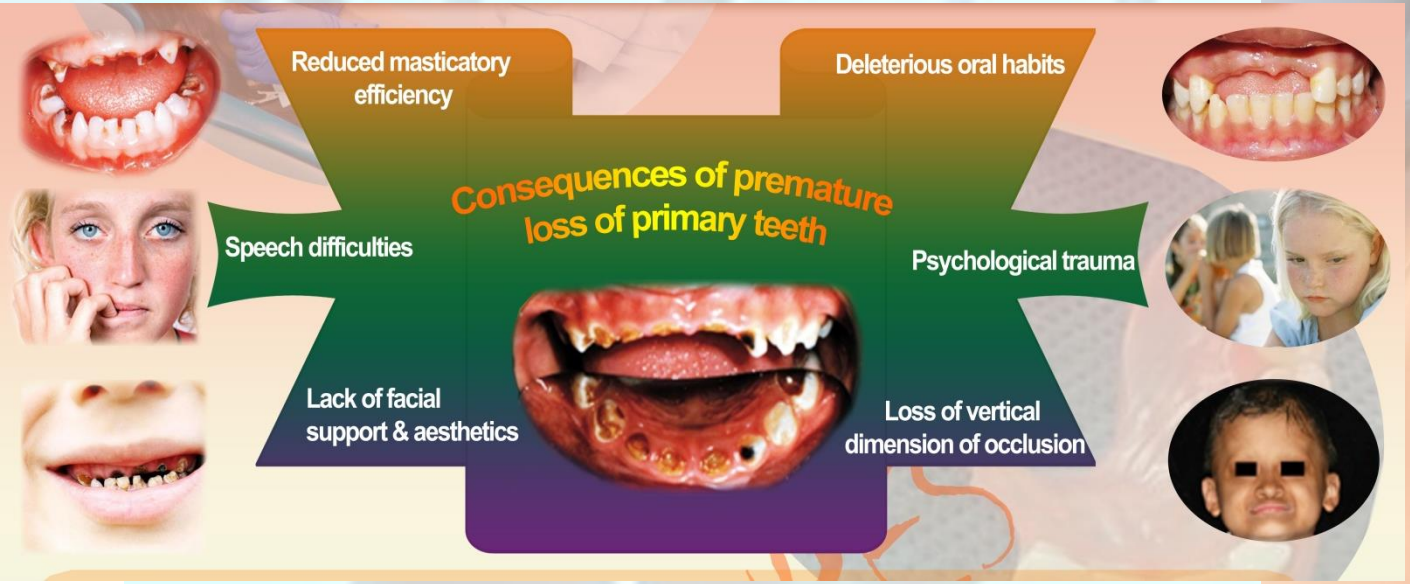
Pulpectomy is a root canal procedure for pulp tissue that is irreversibly infected or necrotic due to caries or trauma. The root canals are debrided and shaped with hand or rotary files.

Dannenburg

….the extirpation of the vital pulp, normal or abnormal followed by sterilization and filling of the root canal.

INTRODUCTION

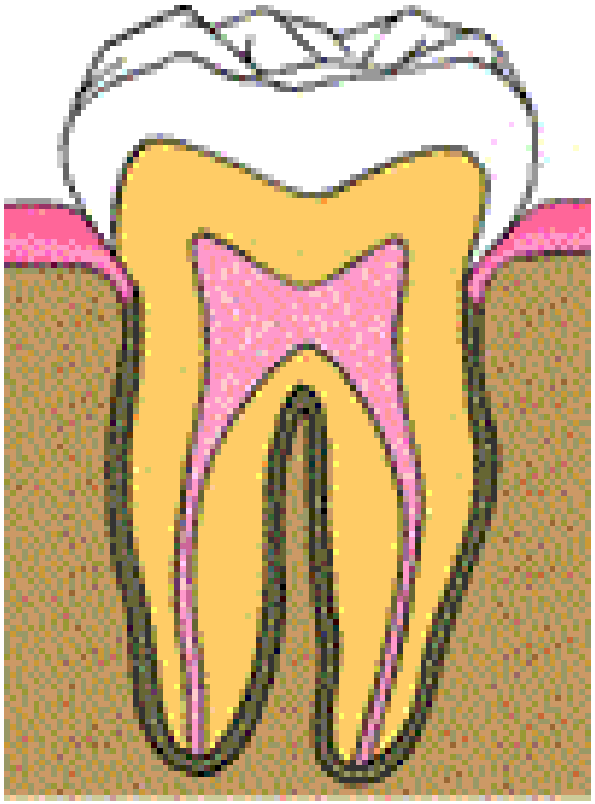
Importance of Pulp Therapy in Pediatric Dentistry



- Mesial drift
- Absence of a succedaneous tooth.
- Maintain normal eruption time of the succedaneous teeth.

Primary Goal

To eliminate infection and retain the tooth in a functional state foliated, without endange dentition or the health of the

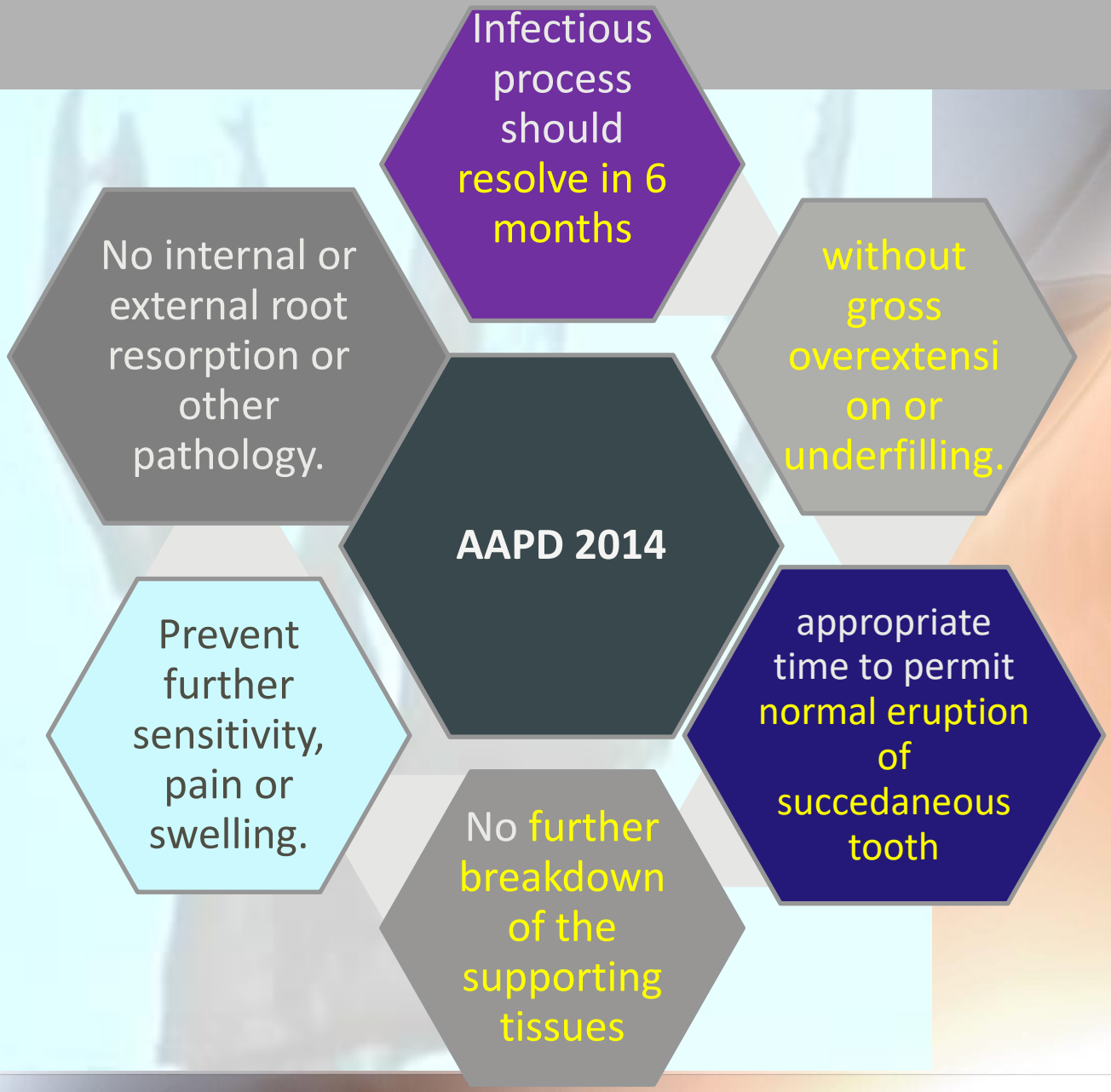


by

Successful treatr ved tooth is to retain it in a h may fulfill its role as a useful cor nd young permanent de

Lewis and Law

Objectives of Pulpectomy



Rationale

To **gain access**

To **remove as much as dead**

Non-infected

Treatment Objectives

Tooth free of infection

Biomechanically cleanse & obturate root canals

Promote physiologic root resorption

Hold space for the erupting perm tooth

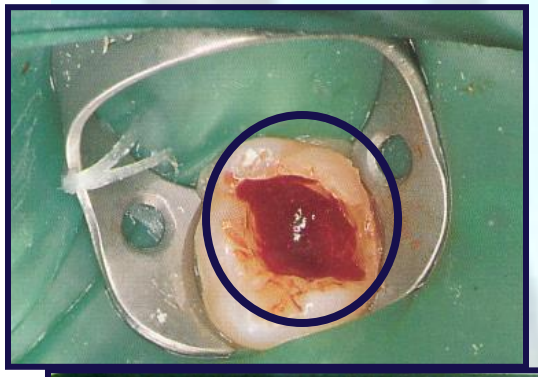
Indications - AAPD 2014

A pulpectomy is indicated in a primary tooth with irreversible pulpitis or necrosis or a tooth treatment planned for pulpotomy in which the radicular pulp exhibits clinical signs of irreversible pulpitis

The roots should exhibit minimal or no resorption.

Major Indications

Primary teeth with pulpal inflammation extending beyond the coronal pulp but with roots and alveolar bone free of pathologic resorption



Primary teeth with necrotic pulps, minimum root resorption, and minimum bony destruction in bifurcation area

- Primary teeth with evidence of furcation pathology
- Presence of an abscess

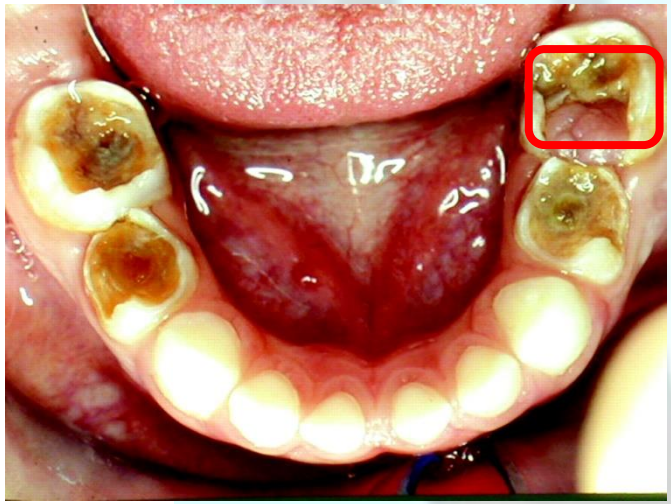
Other Indications

- Teeth with poor chance of vital pulp treatment
- Strategic importance for space maintenance
- Absence of surrounding bone loss from infection
- Pulpless primary teeth
  - with sinus tracts
  - without permanent successors
  - in hemophiliacs
  - next to the line of a palatal cleft
  - anterior teeth when speech, crowded arches, or esthetics are a factor
  - when space maintainers or continued supervision are not feasible (handicapped or isolated children)
- Pulpless primary molars
  - supporting orthodontic appliances
  - when arch length is deficient
  - second molars before eruption of perm first molar
- Cooperative patient
- Expectation of restorability

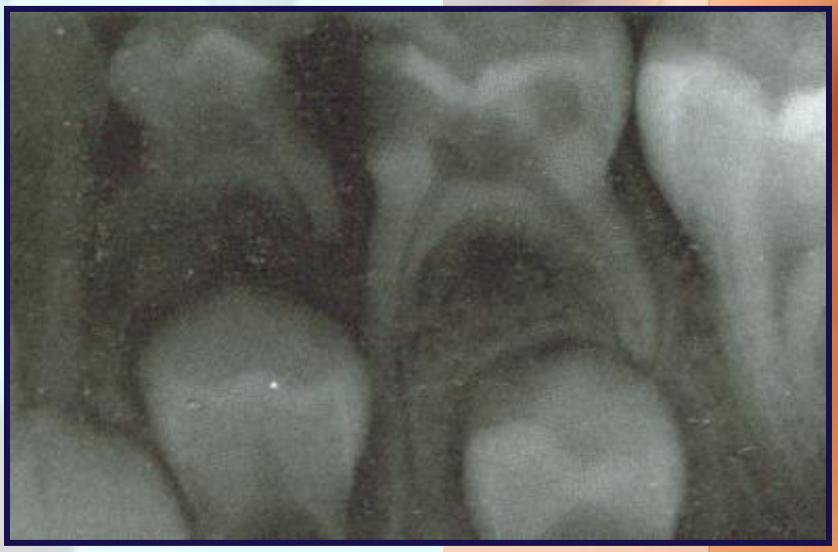
Major Contraindications…

Unrestorable crown

(Root stumps)



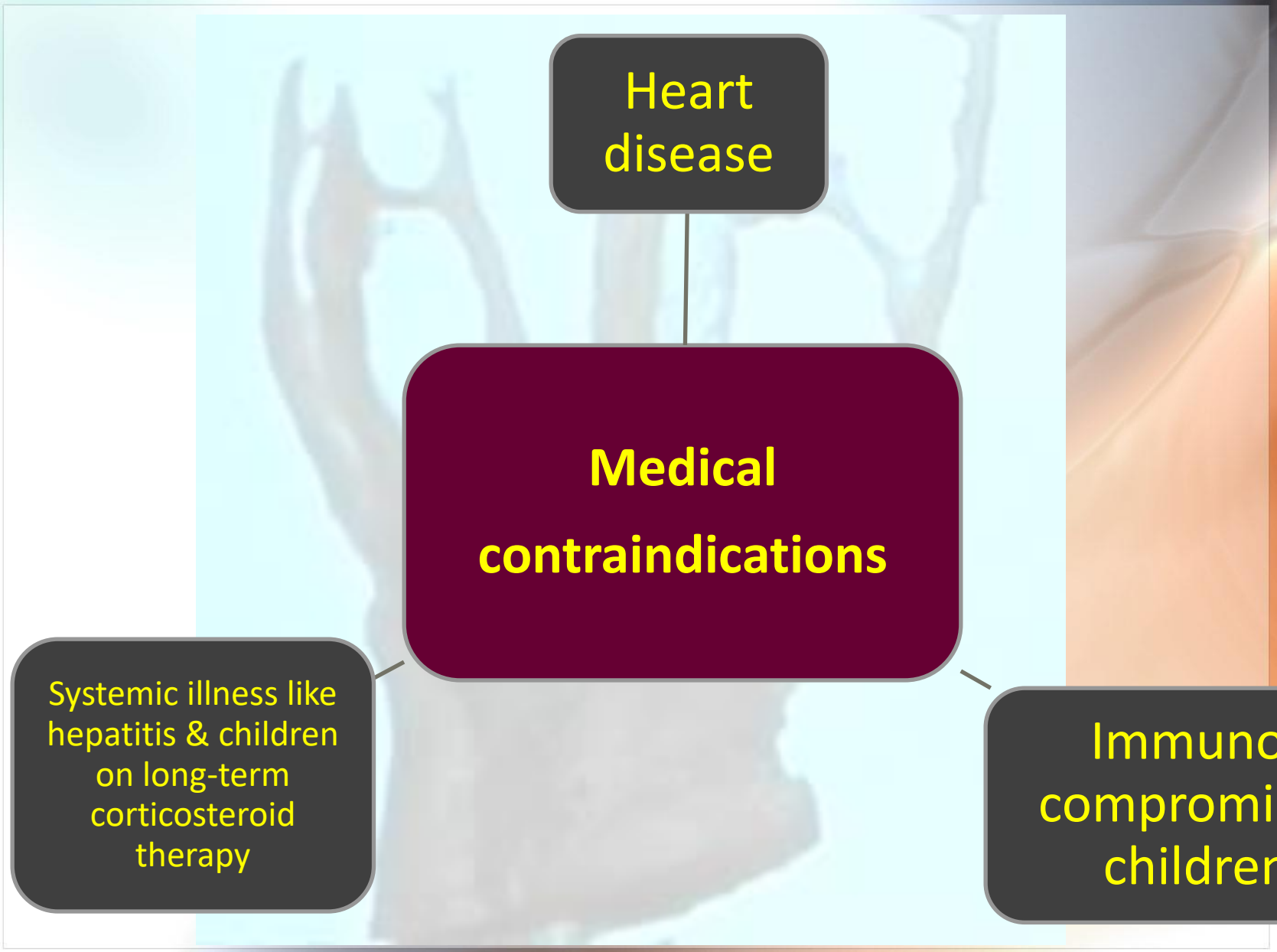
Advanced pathological root resorption



Other Contraindications

- Peri-radicular involvement extending to the permanent tooth bud
- Pathologic resorption of more than1/3rd of root with a fistulous sinus tract
- Excessive internal resorption
- Extensive pulp floor opening into bifurcation
- Primary teeth with underlying dentigerous or follicular cysts

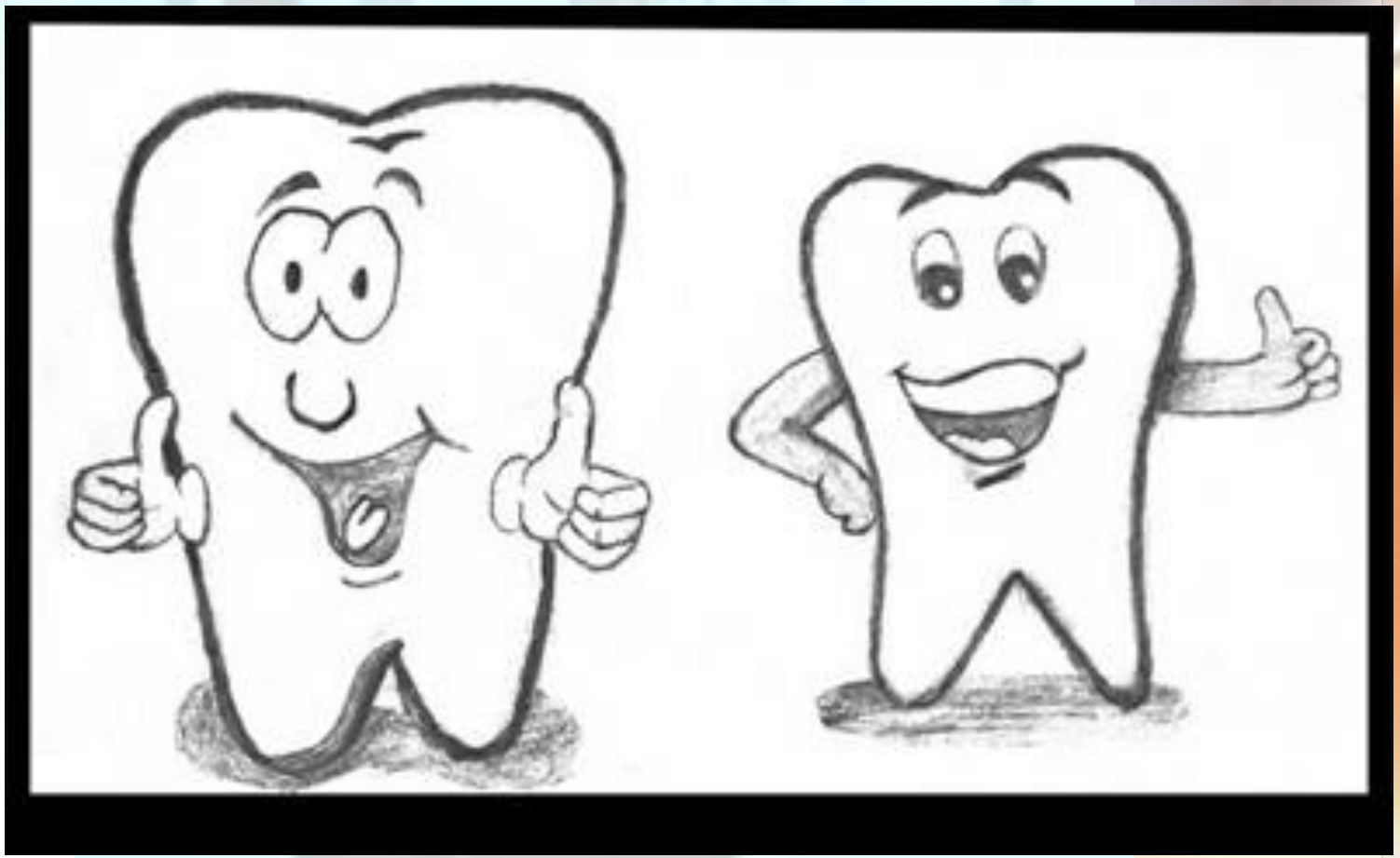
Medical contraindications



OVER ALL

INDICATIONS	CONTRAINDICATIONS
Strategically important tooth (e.g; in case of the deciduous second molar where the permanent first molar has not erupted) Irreversible pulpitis. Minimal periapical changes with sufficient bone support. At least 2/3 rd of the root length available. Internal resorption without any obvious perforation.	▪Systemic conditions Lack of patient cooperation Excessive mobility Non-restorable tooth Pathological resorption of > 1/3 root

Primary teeth vs Permanent teeth ????



Uniqueness of primary teeth

Finn; Nelson & Ash

More accessory canals, foramina

more ribbon-like

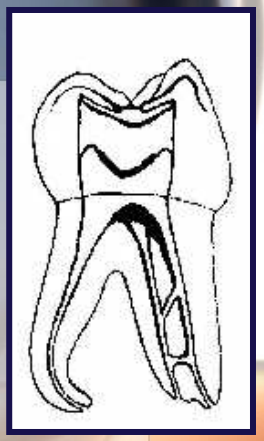
Flared out roots

Enamel dentin smaller; pulp chamber large

More difficult canal debridement

Increased potential of root perforation

Treatment considerations



- Complexity of the root canal system:
  - numerous lateral canals,
  - accessory canals,
  - areas of internal resorption,
  - communication with furcation,
  - variations in shape of canal at their apical terminus and
  - increase in incidence of lateral and accessory canals with the onset of root resorption
  - Ongoing resorption
  - Inability to determine anatomical apex

- Restorability of the tooth subsequent to treatment:
  - adequate tooth structure should remain
- Periodontal tissue health:
  - periodontal tissues -- sound or amenable to treatment
  - no excessive mobility of the tooth
  - fistula of periodontal origin -- poor prognosis

- Anatomy of the mouth and specific tooth to be treated:
  - size of mouth and tongue,
  - angulation and alignment of teeth
- Systemic condition of the child patient:
  - Pre-treatment & post treatment antibiotic coverage is required for the rheumatic heart disease patient
- Radiographic interpretation
  - extent of the carious lesion,
  - status of the lamina dura,
  - presence of abnormal resorptive processes /radicular rarefactions
- Manageability of pedodontic patient:

Evaluation of Treatment Prognosis before Pulp Therapy

- Tooth favorable to therapy
- Extraction & space management
- Pt. & parent cooperation
- Maintenance of oral health & hygiene

ENDODONTIC CAVITY PREPARATION

ENDODONTIC TRIAD

Access Cavity Preparation

Key that opens the door

"to search a black cat in a dark room"

Access cavity preparation

- Access cavity preparation generally refers to the part of the cavity from the occlusion table to the canal orifice***(Stephen Cohen***).

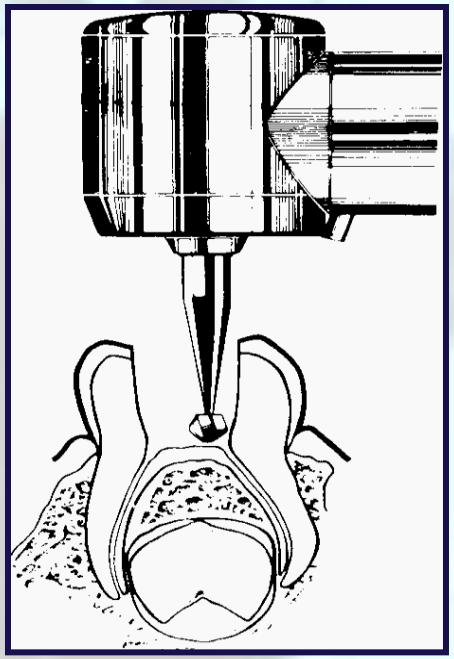
- **Objectives**:
  - **To achieve a straight or direct line access to the apical foramen.**
  - **To locate all root canal orifice.**
  - **To conserve sound tooth structure.**

Guidelines

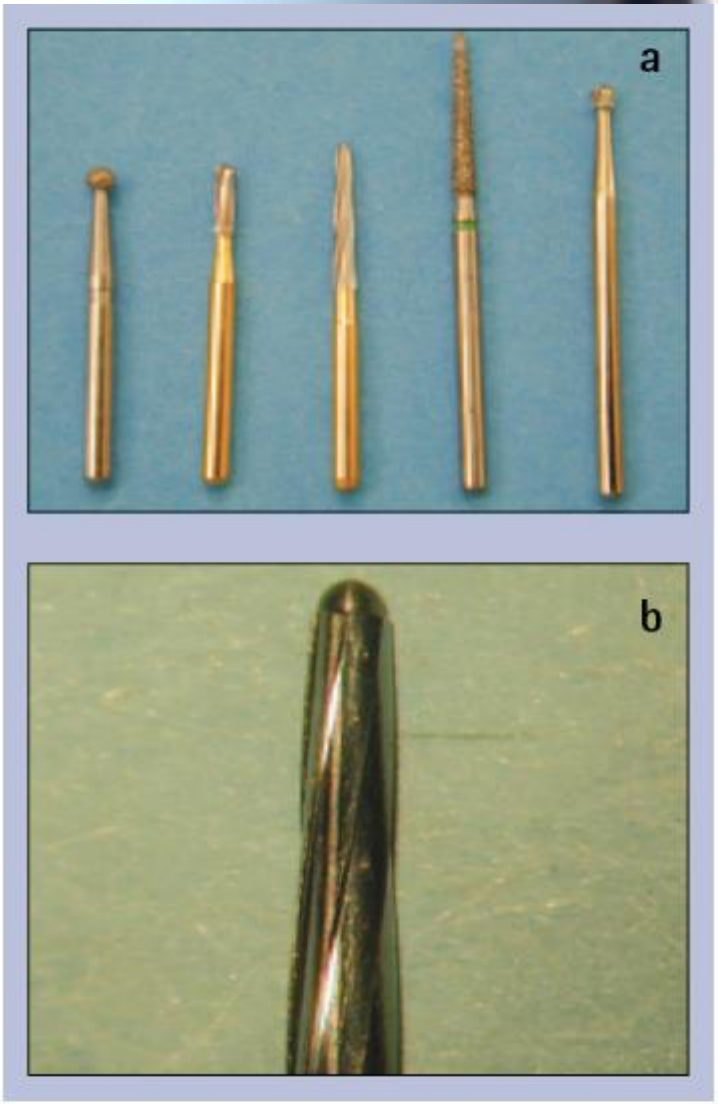
- Visualization of internal anatomy
- Evaluation of CEJ and occlusal anatomy.
- Preparation of the access cavity is through lingual in anterior teeth and on the posterior teeth through occlusal surface.
- Removal of unsupported tooth structure.
- Creation of access cavity walls.

Imp diff b/w prim and perm teeth

- Length and shape of crowns
- Dentinal wall at pulpal floor and
- Depth ,distance from occlusal surface



ARMAMENTARIUM



Figs 8 a-b (a) left to right, #2 round diamond bur, tungsten carbide fissure bur, Endo Z bur, Axxcess bur and #2 tungsten carbide round bur, the last two burs (SybronEndo, Orange, CA, USA) have a longer shank and allow better vision when used with magnification. (b) Close up of the non-end cutting Endo-Z bur (Dentsply Maillefer Instruments, Ballaigues, Switzerland)

i. Round burs (#2, #4 and #6) → (Fig. 3)

ii. Tapering fissure bur with a round head → (Fig. 4)

Fig. 3 Round bur

Fig. 4 Tapering fissure bur with a round head

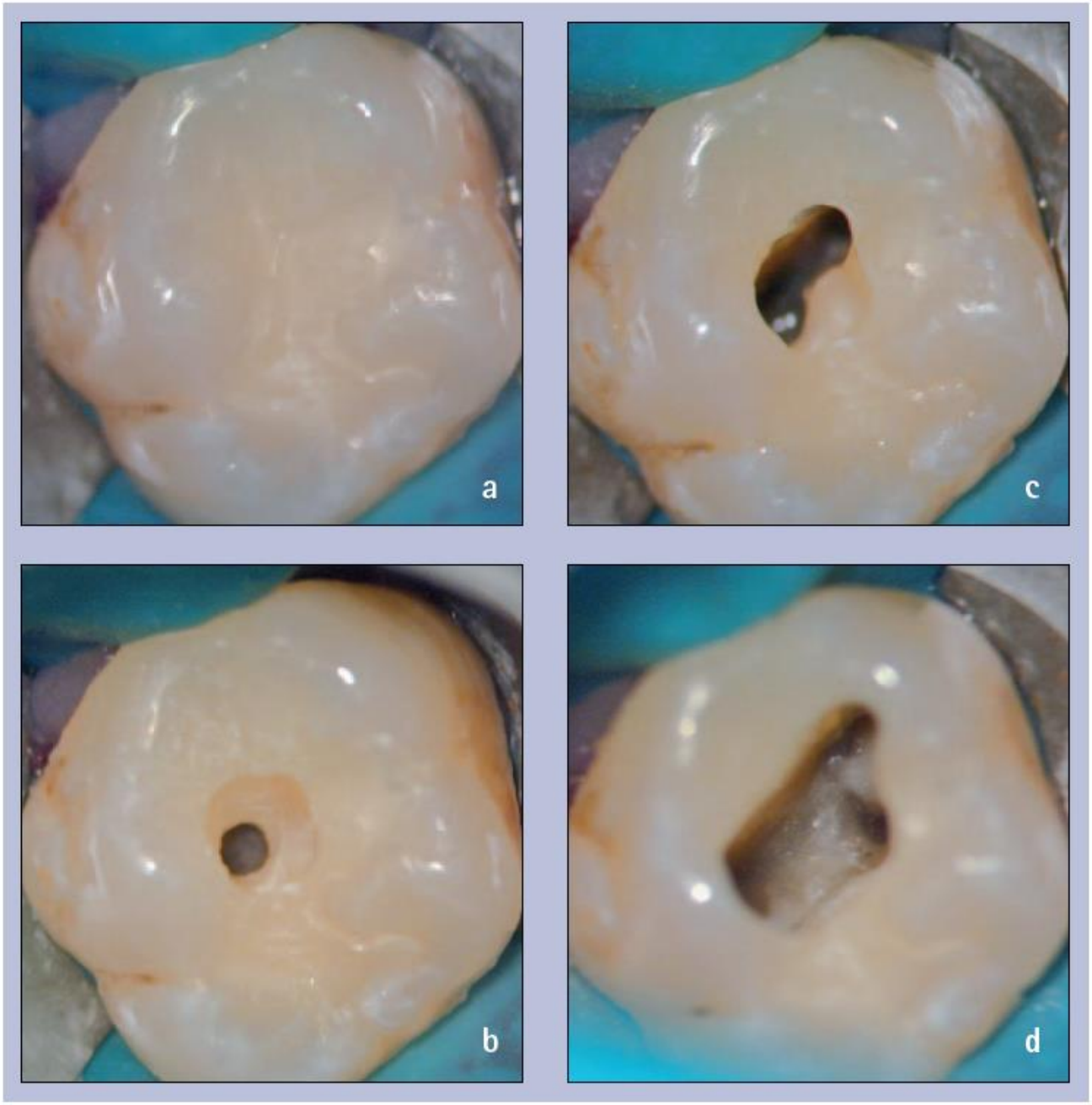
iii. Safe end burs e.g.: Endo Z bur → (Fig. 5)

Fig. 5 Endo Z – Safe end cutting bur

c. Orifice Enlargers

i. X Gates → (Fig. 13)

Fig. 13 X gates



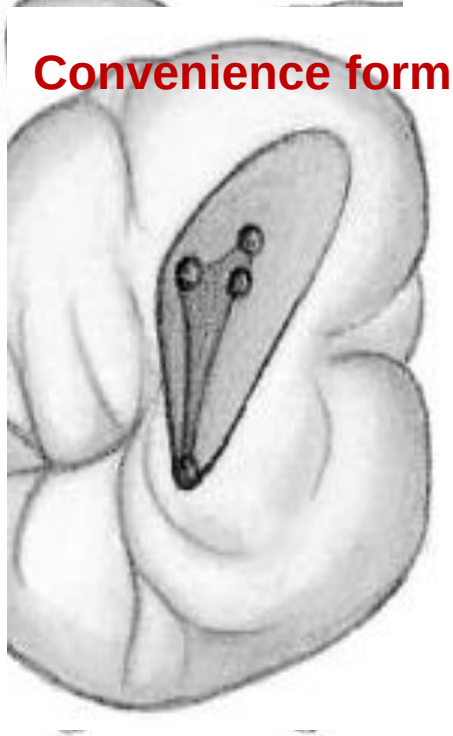
Figs 9 a–d (a, b) The roof of the pulp chamber has been penetrated using a tungsten carbide bur; (c) an 'Endo-Z' bur has been used to completely remove the roof of the pulp chamber. (d) All canals readily identifiable

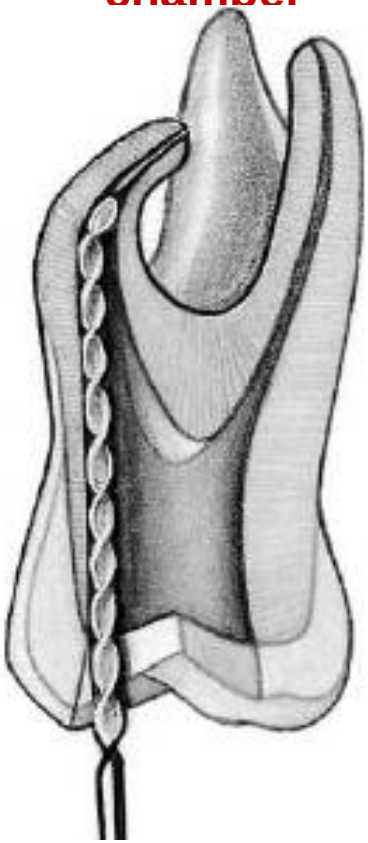
Size of pulp chamber

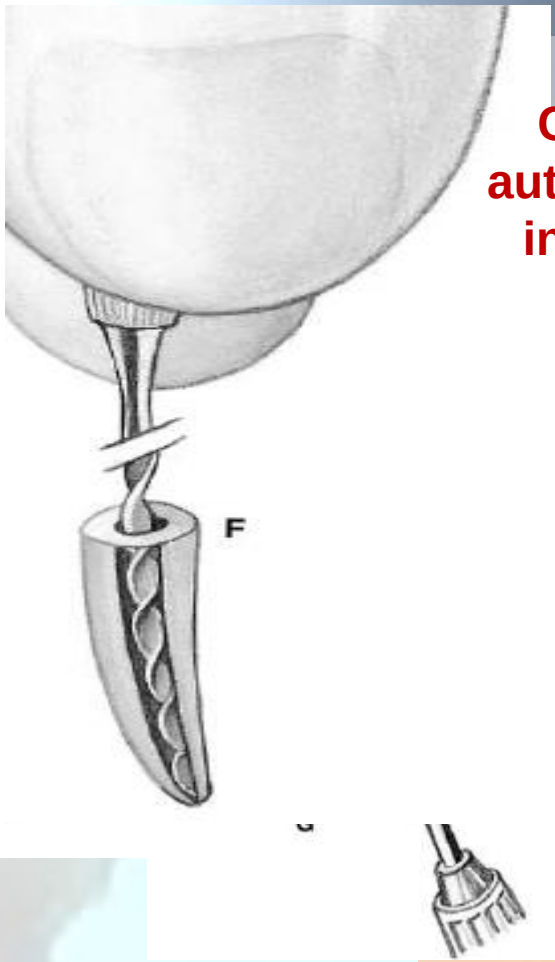
Shape of pulp chamber

Position of

Convenience form







Complete authority over instrument

Exploration of the canal orifice

- Curved path finder file
  - Explore the walls
  - Length or direction
- Canal exploration
  - Curvature of canal

b. DG – 16 Endodontic Explorer → (Fig. 7)

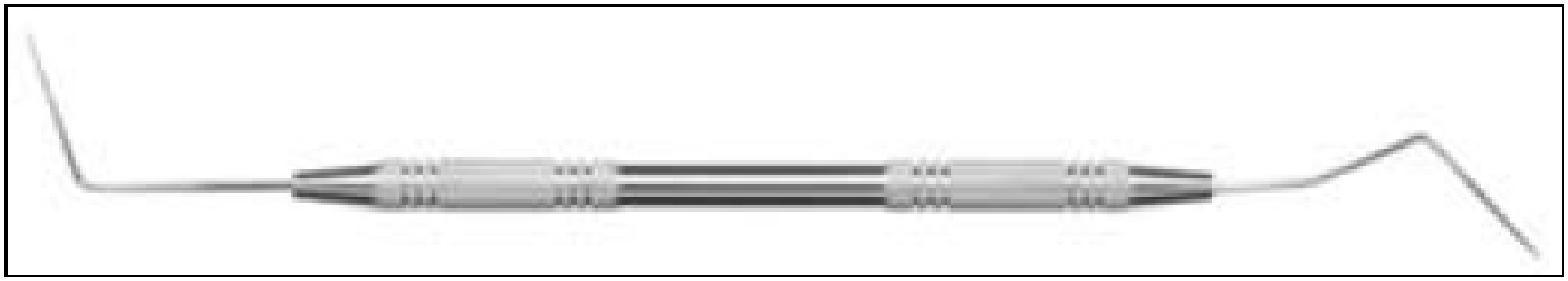
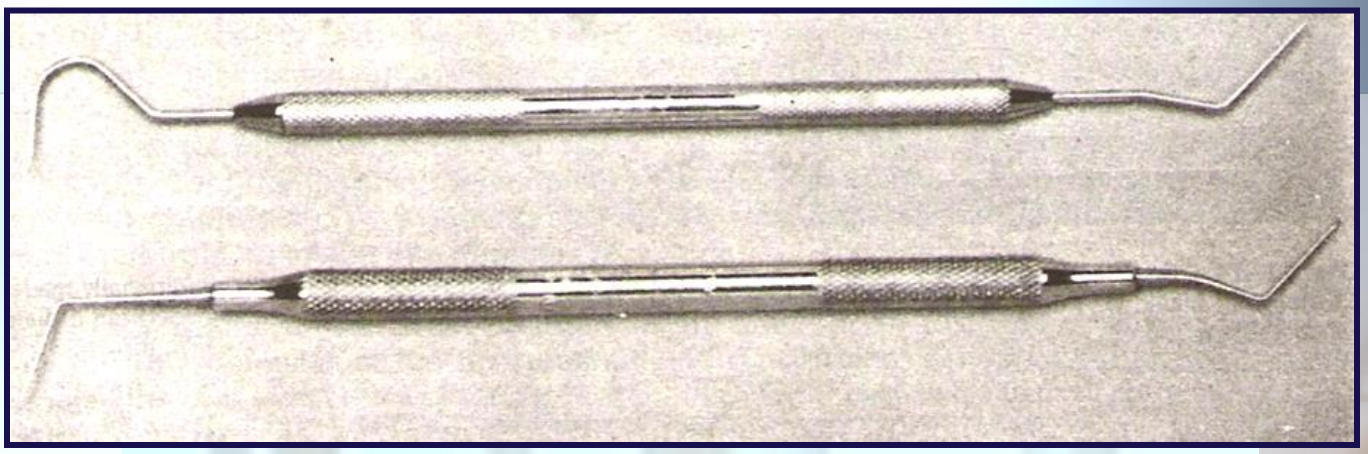


Fig. 7 DG 16

c. Endodontic Spoon excavator → (Fig. 8)

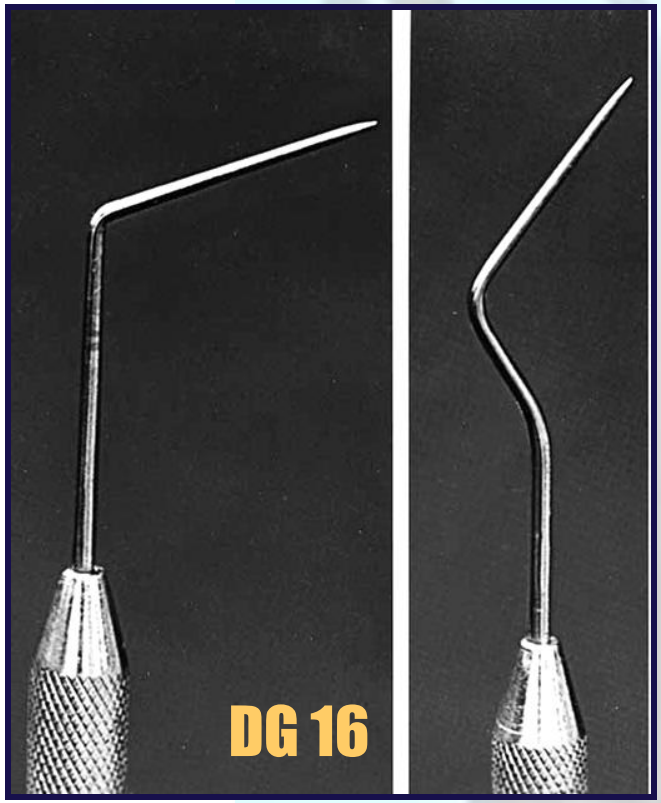
Fig. 8 Endodontic excavator



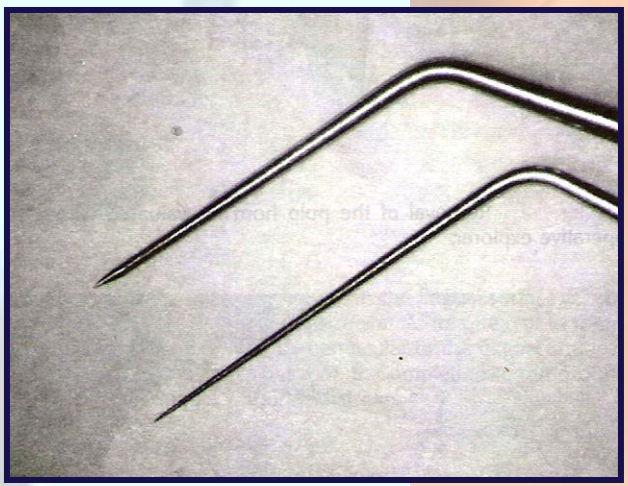
Explorer:

No. 23-16

DG 16



Right angle Binangle



Explorer: CK 17

Micro opener & Debrider

- Micro opener
  - 7 mm K type flutes
  - # 10, 15, 0.04, 0.06 tapers
- Micro debrider
  - Hedstrom cutting configuration
  - .02 taper, sizes #20, 30
  - 16mm cutting flutes
  - For hard-to-reach, hard-to-visualize canals

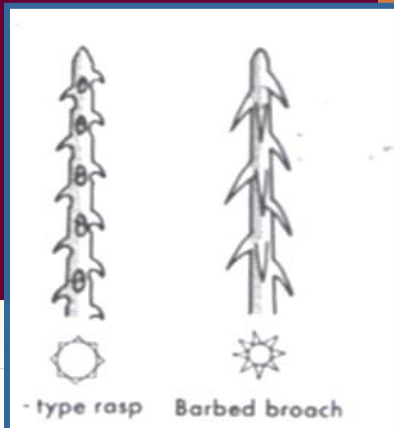
iii. Endodontic Micro Openers (Dentsply Maillefer)

→ (Fig. 14)

Fig. 14 Micro opener

Pulp extirpation

- Broach are used- Stephen wei, Pinkham , Nikhil Marwah
- Broach is preferred- should never engage dentinal walls - Braham morris
- Barbed broach contraindicated – Kennedy
- H files indicated and Reamers are contraindicated Kennedy, Mcdonald
- Endodontic files indicated- Mathewson



STUDIES

AUTHOR	DESCRIPTION
Healey	Broach – worked progressively to remove pulp 1st from coronal, then middle, and apical 1/3rd
Weine	In narrow canals – enlarge to #20 file size then use broach

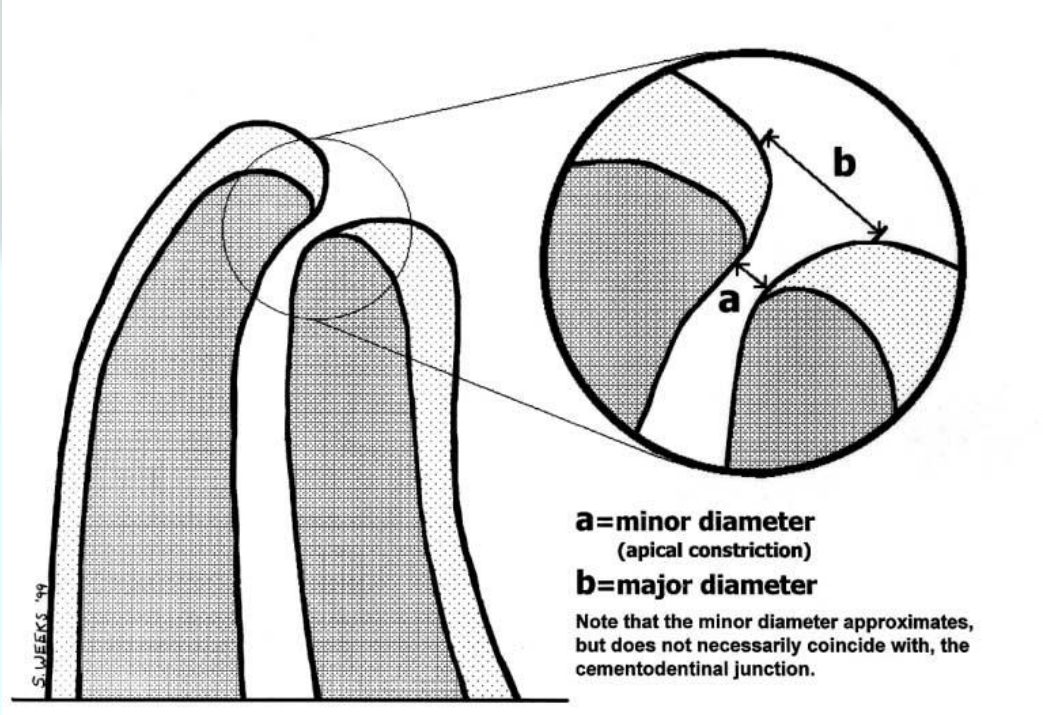
Because of the bizzare anatomy of primary molar root canals the use of barbed broaches as in conventional endodontics may be unsuccessful

Hedstrom files are recommended since they remove hard tissue only on withdrawal , which prevents pushing infected through the apices.

Working Length Determination

Working length

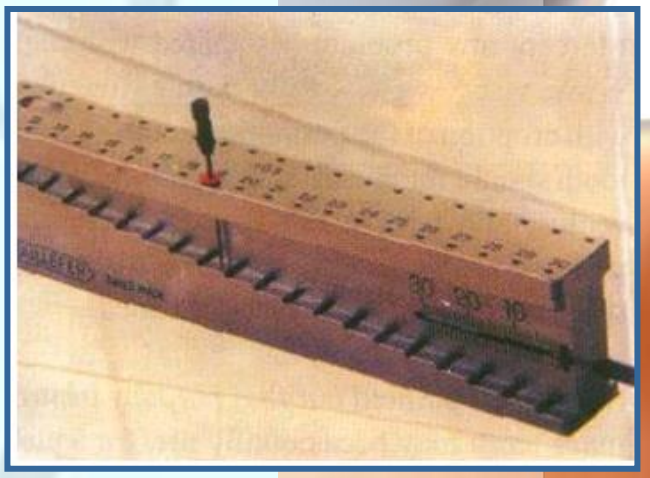
- ***Ingle -*** the distance from a coronal reference point to the point at which canal preparation and obturation should terminate.

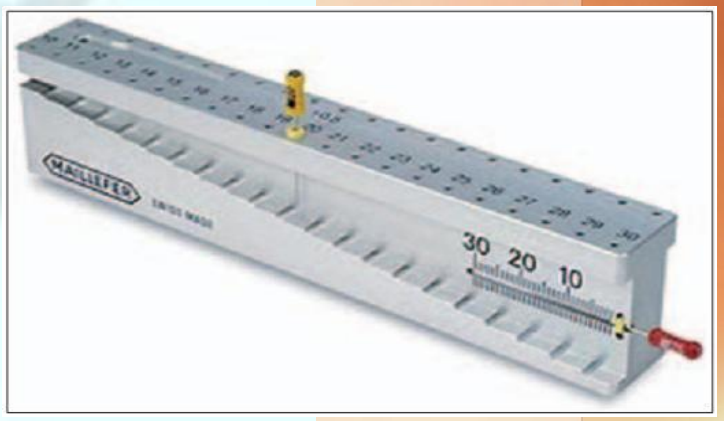


Significance

- Importance
  - Apical perforation
  - Over filling / under filling
  - Incomplete instrumentation
  - Ledge formation

If calculated properly -- success of treatment
If calculated incorrectly-- treatment failure





Requirements

The requirements of an ideal method

- rapid location of the apical constriction
- easy measurement
- rapid periodic monitoring and confirmation
- patient and clinician comfort
- minimal radiation to the patient
- ease of use in special patients such as those with severe gag reflex, reduced mouth opening, pregnancy etc,and
- Cost effectiveness

Methods of working length determination

RADIOGRAPHIC METHODS

- Conventional method
  - Ingle method
  - Grossman method
- Digital radiography
- Xeroradiography
- Radiovisiography
- Tomography

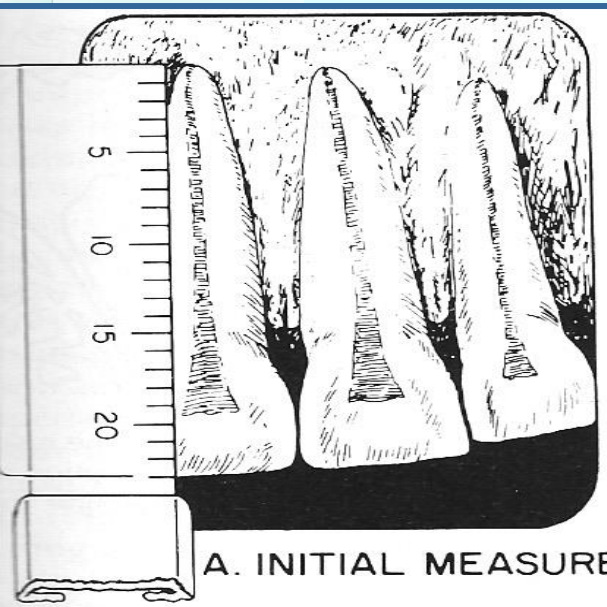
NON RADIOGRAPHIC METHODS

- Tactile sense
- Paper point
- Apical PDL sensitivity
- APEX LOCATORS

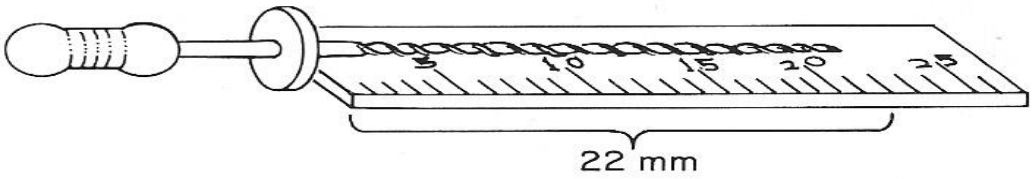
OTHER RADIOGRAPHIC METHODS

- Best's method
- Bregman's method
- Bramante's method
- Grossman's method
- Ingle's method
- Torabinejad's method
- X ray grid system
- Xero radiography
- Direct digital radiography

Conventional radiography – Ingle's method

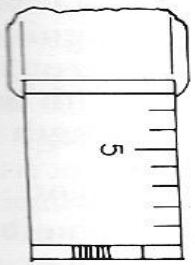


A. INITIAL MEASUREMENT

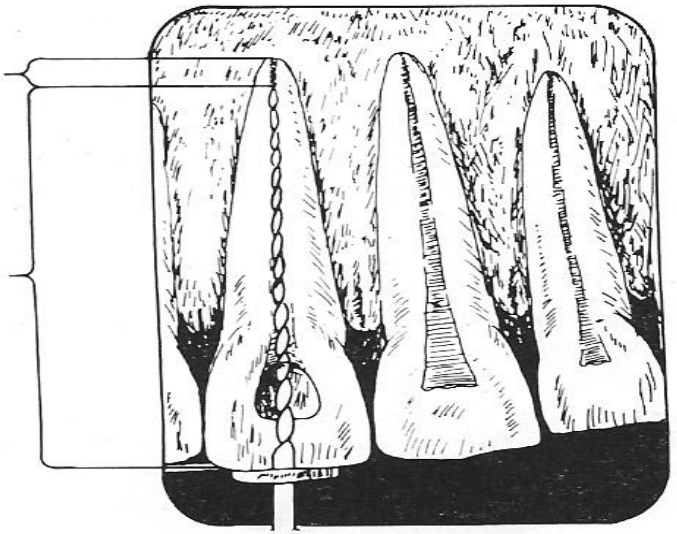


B. TENTATIVE WORKING LENGTH

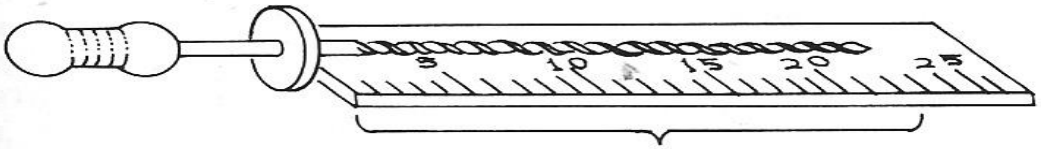
22 mm



	+ 22.0 mm
Adjustment for apical termination short of cementodentinal junction	23.5 mm — 1.0 mm
Final working length	22.5 mm



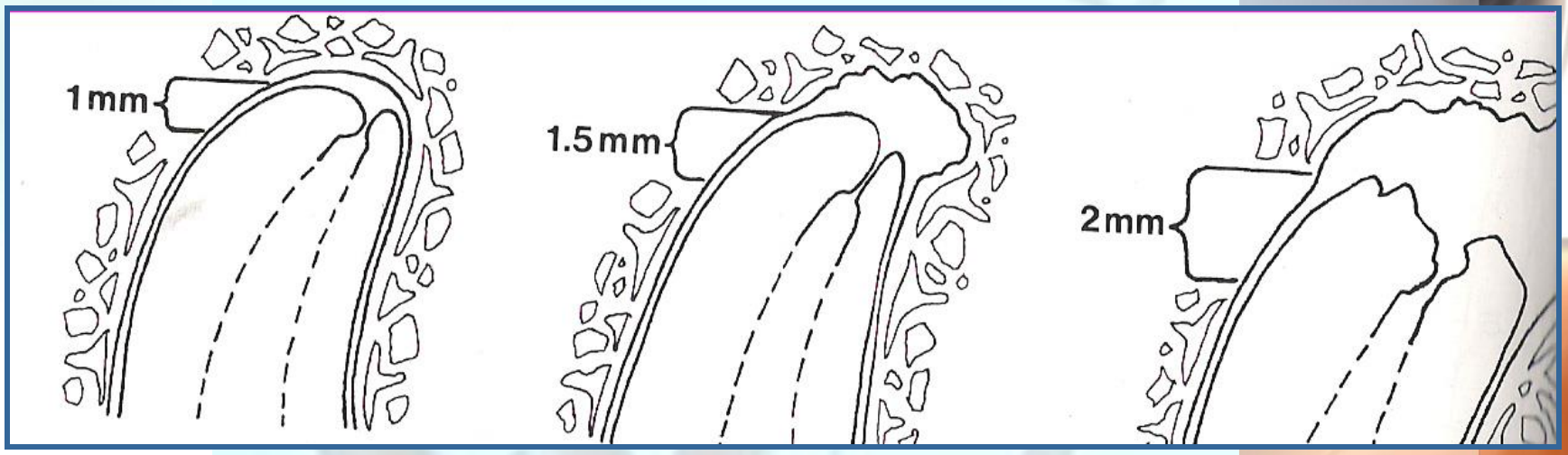
C. FINAL WORKING LENGTH



22.5 mm

D. SETTING INSTRUMENTS

Weine's modification



Grossman method

- actual length of tooth is determined by mathematical formula

- Actual length of tooth =

  $$\frac{\text{actual length of the instrument} \times \text{x-ray length of tooth}}{\text{x ray length of instrument}}$$

- ***In 1992, Salama et al attempted to determine the length of the root canals of primary maxillary incisors and mandibular molars***

Table. Root canal length of maxillary incisors and mandibular molars

	Length in mm	
	Mean	Range
Tooth		
Central	16.5	16-17
Lateral	15	14-16
Tooth and Canal		
First molar		
Mesiobuccal	16.4	15-17
Mesiolingual	14.2	9-15
Distobuccal	13.1	12-15
Distolingual	12.7	10-15
Second molar		
Mesiobuccal	15.8	13-17
Mesiolingual	14.4	11-16
Distobuccal	14.9	13-16
Distolingual	14.9	12-16

STUDIES

AUTHOR	DESCRIPTION
Shearer 1990, Griffith 1999, Hedrick 1994	No statistically significant difference in working length estimation accuracy between conventional film, direct digital radiography, and xeroradiography.
Seidberg 1975 ***Bal CS 1989*** ***Stabholz 1995***	**TACTILE SENSE:** **68% accuracy** **If canals are preflared 75% accuracy** **If not preflared 33% accuracy** **Ineffective in open apex root, excessive curvature, constricted canals.**
Neena IE et al 2011 	**Apex locator is comparable to conventional radiograph in determining the working length without radiation in the primary teeth. Intraoral digital radiography is the safest method in determining the working length with significant reduction in radiation exposure**

STUDIES

AUTHOR	DESCRIPTION
Ahsan Abdullah et al ***IJCPD 2016***	Radiovisiography and apex locators are equally effective in determining working length in primary teeth.
Priya Mittal et al J Dent Specialities.2016	**Group I - radiographic measurement using paralleling technique, Group II - electronic working length measurement using Raypex 6 apex locator, Group III – tactile working length, Group IV – paper point working length and Group V - combination of apex locator, tactile and paper point techniques.** **Combined electronic, tactile and paper point working length (CETPPWL) method showed 99.5% of accuracy** **Hence Combination of use of apex locator, tactile and paper point method is recommended.**

Cleaning and shaping

Objective of cleaning and shaping

- **Biological objective:**
  - Minimize bacterial count and necrotic material in root canal
- **Technical objective:**
  - Continuously tapering funnel
  - The root canal preparation should maintain the path of the original canal
  - The apical foramen should remain in its original position
  - The apical opening should be kept as small as practical

Principles

- Direct **straight line access**
- Length accurately determined
- Sequential hand instrumentation with periodic **recapitulation**
- Instrumentation with quarter to half turn and withdrawn with pull stroke
- Barbed broaches – with caution
- Rubber stops
- Apex –enlarged three times the size of the first binding instrument
- Instrumentation in wet canal
- Debris not forced to PA area
- Avoid trauma to PA area

Acc to Ingle:-

- *ISO Gp I*: Hand use only.

  Eg- k files, H files, broach, pluggers, spreaders,U type files.

- *ISO Gp II:* Engine driven latch type.

  Eg-similar in design to Gp I ,but attached to hand piece.

  paste fillers also included here.

- *ISO Gp III:* Engine driven latch type

  Eg-gates glidden, paeso reamer, kurer root facer.

- *ISO GP IV:*Root canal filling instruments.

.

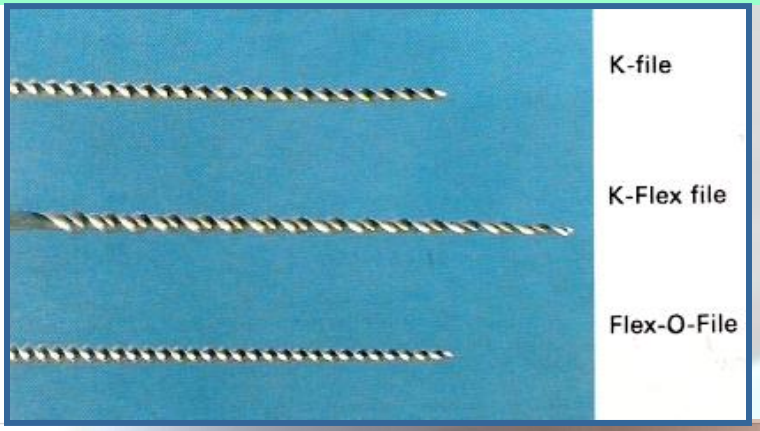
K-FILES

K-FILES: It is twisting square or triangular metal blanks along their long axis, producing **partly horizontal cutting blades**.

Ni-Ti-K Files: It is especially useful for apical enlargement in **curved canals.**

The application of clockwise and counter clockwise.

Rotational and translational working strokes.



K flex file:

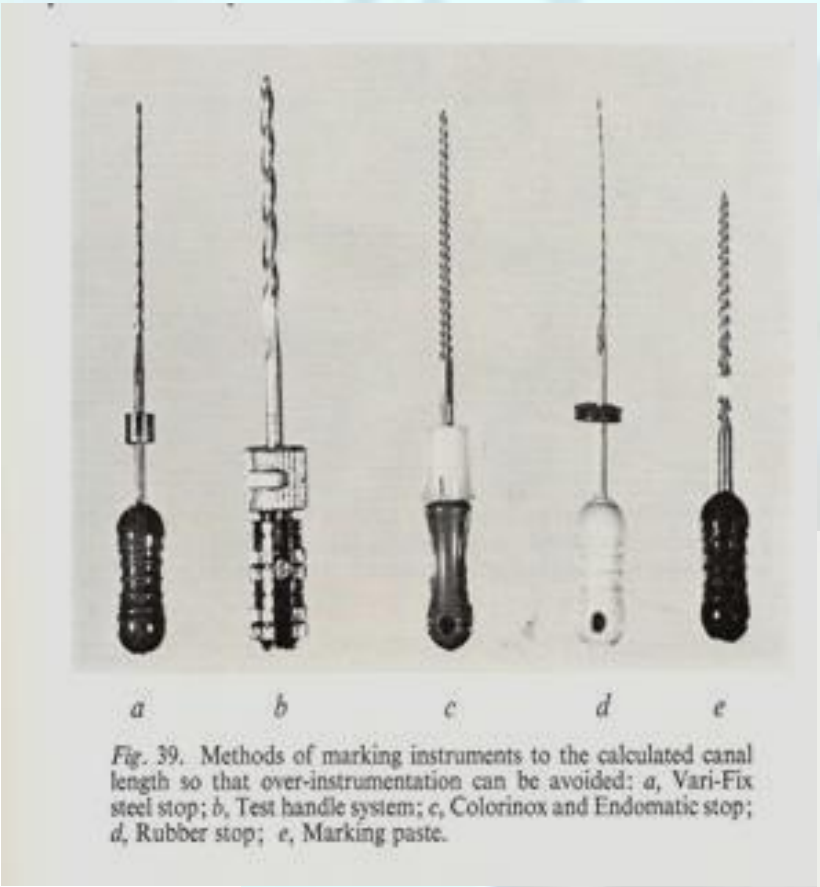
K- flex O file:
K- flex R file/ Roane file
Triple flex file:

ISO COLOR CODING

Color code	ISO size	$d_1 \pm 0.02$ mm	$d_2 \pm 0.02$ mm
	006	0.06	0.38
	008	0.08	0.40
	010	0.10	0.42
	015	0.15	0.47
	020	0.20	0.52
	025	0.25	0.57
	030	0.30	0.62
	035	0.35	0.67
	040	0.40	0.72
	045	0.45	0.77
	050	0.50	0.82
	055	0.55	0.87
	060	0.60	0.92
	070	0.70	1.02
	080	0.80	1.12
	090	0.90	1.22
	100	1.00	1.32
	110	1.10	1.42
	120	1.20	1.52
	130	1.30	1.62
	140	1.40	1.72

Pink
Gray
Purple
White
Yellow
Red
Blue
Green
Black
White
.
.

Stop Attachments



a b c d e

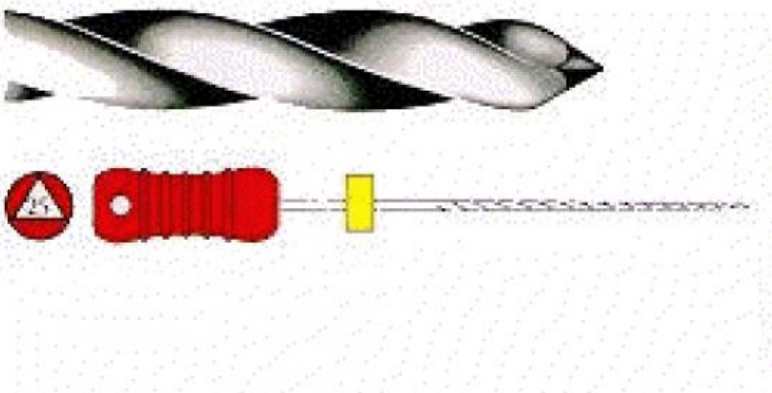
Fig. 39. Methods of marking instruments to the calculated canal length so that over-instrumentation can be avoided: *a*, Vari-Fix steel stop; *b*, Test handle system; *c*, Colorinox and Endomatic stop; *d*, Rubber stop; *e*, Marking paste.

7.69, 7.70 Different types of stops

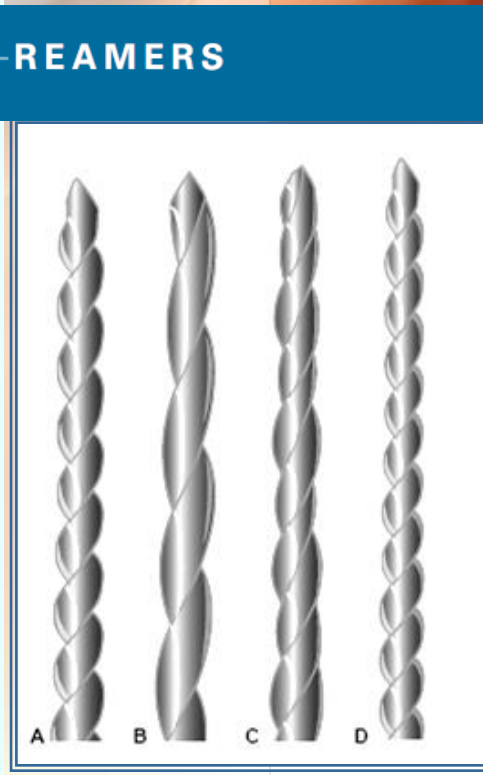
FIGURE 3-1 Sure-Stop silicone endodontic stop dispenser. (Courtesy Dentsply Maillefer, Tulsa, OK.)

K –Type Reamers & Files (Ansi 28)

- Reaming: penetration, rotation (¼- ½) and retraction.
- They are more efficient in removing tooth structure than files (2.5 times more) because of triangular cross section.

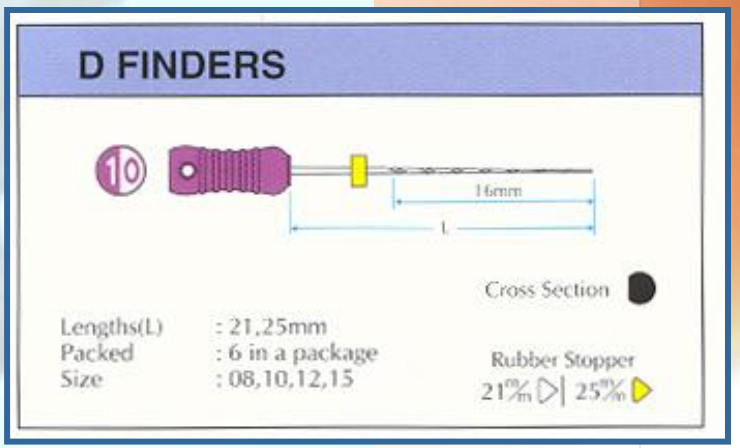


Root Canal Reamer



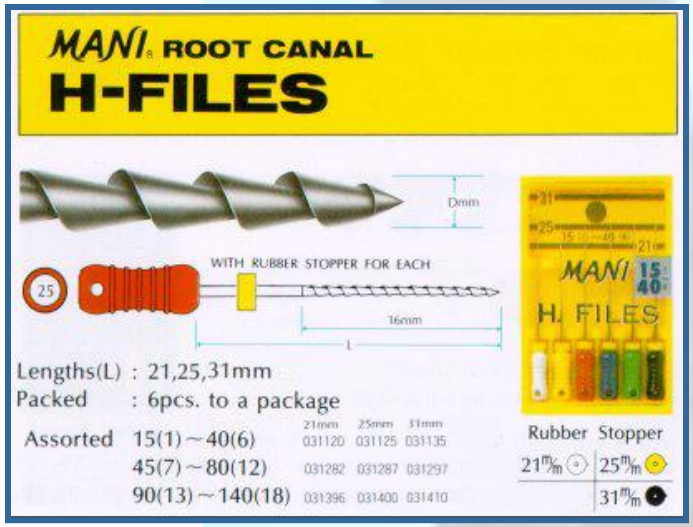
Pathfinder

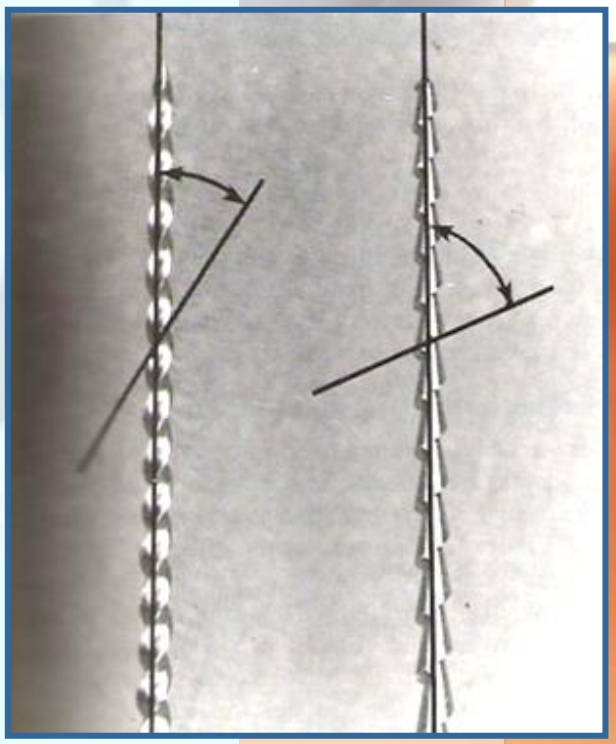
- Narrower taper
- Used to negotiate calcified, constricted canals
- ProFinder: variable minimal taper, #10,13,17, lengths: 18, 21, 25 mm



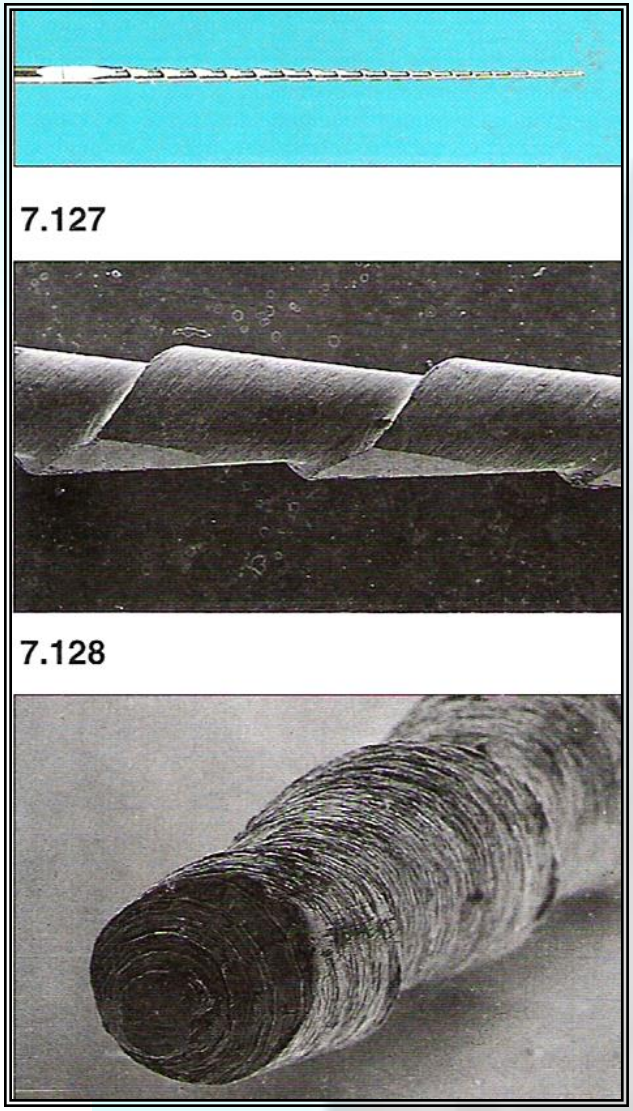
Hedstrom Files (ANSI 58)

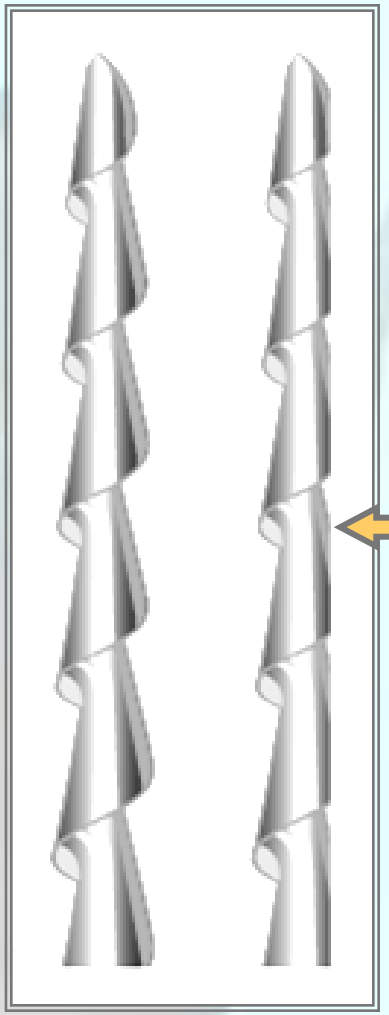
- Milled instrument- multiaxial grinding
- Positive rake angle
- Cuts in pull motion
- Retraction





Safety Hedstrom File



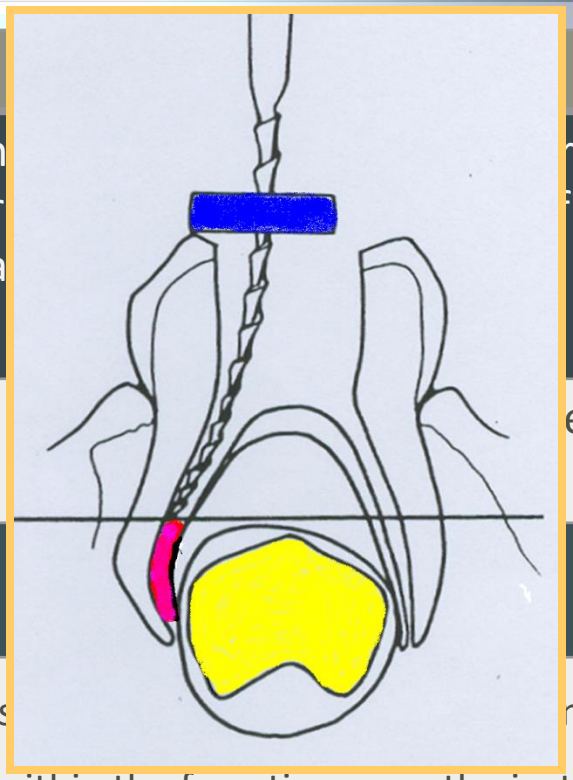


Safe sided

In primary teeth……

- K files & H files are widely used in primary tooth.
- Crown down preparation
- Canals enlarged to size 35 or 40
- Apical preparation
- Cleaning the canals—utmost important as against shaping
- Shaping done on canal walls away from furcation
- Zipping & perforation common-- resorption
- Rotary instruments may be used for better results

AUTHOR	
Kennedy, Braham Morris	Each instr capa ree or four first file
Kennedy	e used
Mathewson	No.35
–- Garcia Godoy-	In cas nent tooth bud was within the furcation area, the instrumentation of the canal be **limited to a level above the occlusal plane of the unerupted teeth**
Stewart,Troutman	Instrumentation should be 2-3mm short



Rotary endodontics in pediatric dentistry

Rotary endodontics in primary teeth – A review ;Sageena George et al 2016

Mechanical preparation of primary teeth utilizing Ni–Ti rotary files was first done by Barr et al. (2000)

Ni–Ti PROFILE(Barr et al., 1999, 2000).

PROFLE 0.04 taper 29 series(Shashikiran, 2006).

K3 Rotary System (Elmsallati et al.,2006).

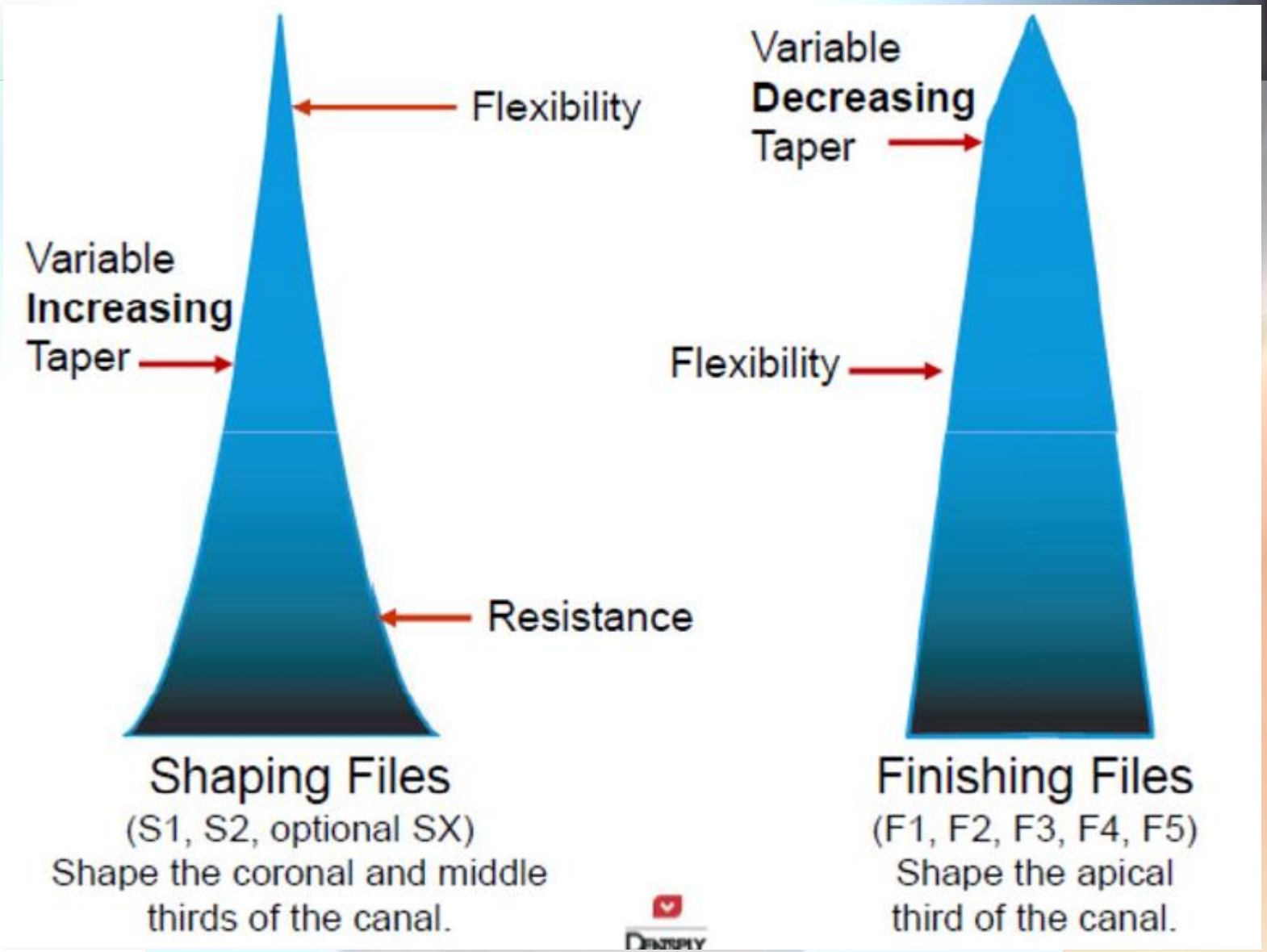
Mtwo rotary system(Kuzekanani et al., 2009; Malagino et al., 2012;)

Flex-Master system (Makarem et al., 2014)

Hero 642 system (Schafer, 2001)

Pro Taper Next has recently been introduced which consists of five files (X1–X5). (Dhingra et al., 2014; Rahman et al.,2014).

Wave-One and Reciproc brands of Ni–Ti instruments adopted the single file system and advocated the reciprocation concept. These files are made of a special Ni–Ti alloy calledM-wire(Lim et al., 2013; Plotino et al., 2012).



The differences between Shaping and Finishing file shapes

NiTi systems in primary teeth….????

- Barr ES et al (2000)
  - More effective in debriding uneven walls
  - Provide consistently uniform , predictable fill

Advantages

- Tissue and debris more easily & quickly removed
- Niti files flexible, allowing easy access
- Prepared canals – funnel shaped – predictable uniform paste fill

Disadvantages

- Cost of handpiece
- Increased cost of NT
- Learning the technique

STUDIES

AUTHOR	DESCRIPTION
Iqbal musani et al **IJCPD 2009**	Evaluated the biological cleaning efficacy by **microbial quantification** using two files K-files and hand protapers Increase success rate with protapers.
Sérgio Luiz Pinheiro et al 2012	Analysis of the **instrumentation time** between manual and rotary techniques in deciduous molars ProTaper system revealed shorter treatment time compared to the other techniques, thus being indicated for deciduous teeth
Mohammad Reza Azar et al **DRJ 2012**	Comparison of the **cleaning capacity** of Mtwo and ProTaper rotary systems and manual instruments in primary teeth Manual K-files were similarly effective in all three parts of the canal, as were Mtwo rotary files.

AUTHOR	DESCRIPTION
Farhin Katge et al **JISPPD 2014**	Comparison of **instrumentation time and cleaning efficacy** of manual instrumentation, rotary systems and reciprocating systems in primary teeth: An in vitro study WaveOne's cleaning ability was the best amongst the three file systems. instrumentation time: WaveOne (reciprocating system) took less time than the other two file systems
Bibhas Dey et al **2016 IJOHMR**	A Comparison of Ni-Ti Rotary and Hand Files Instrumentation in Primary Teeth – A Review Article **Rotary root canal instrumentation would make the treatment time for root canal preparation shorter hence increasing its benefits for utilisation in deciduous teeth**
Haridoss SelvaKumar et al **2016 JCDR**	Computed Tomographic Evaluation of K3 Rotary and Stainless Steel K File Instrumentation in Primary Teeth K3 files (.02 taper) generated less dentine removal than the stainless steel K file and K3 files (.04 taper). K3 rotary files were more effective for root canal instrumentation in primary teeth.

- Root canal irrigants
- Obturation –Materials used for obturation
- Obturation techniques

- Types of pulpectomy- single visit, multi-visit, laser
- Success criteria for pulpectomy
- Pulpectomy –a controversy
- Limitations
- Complications

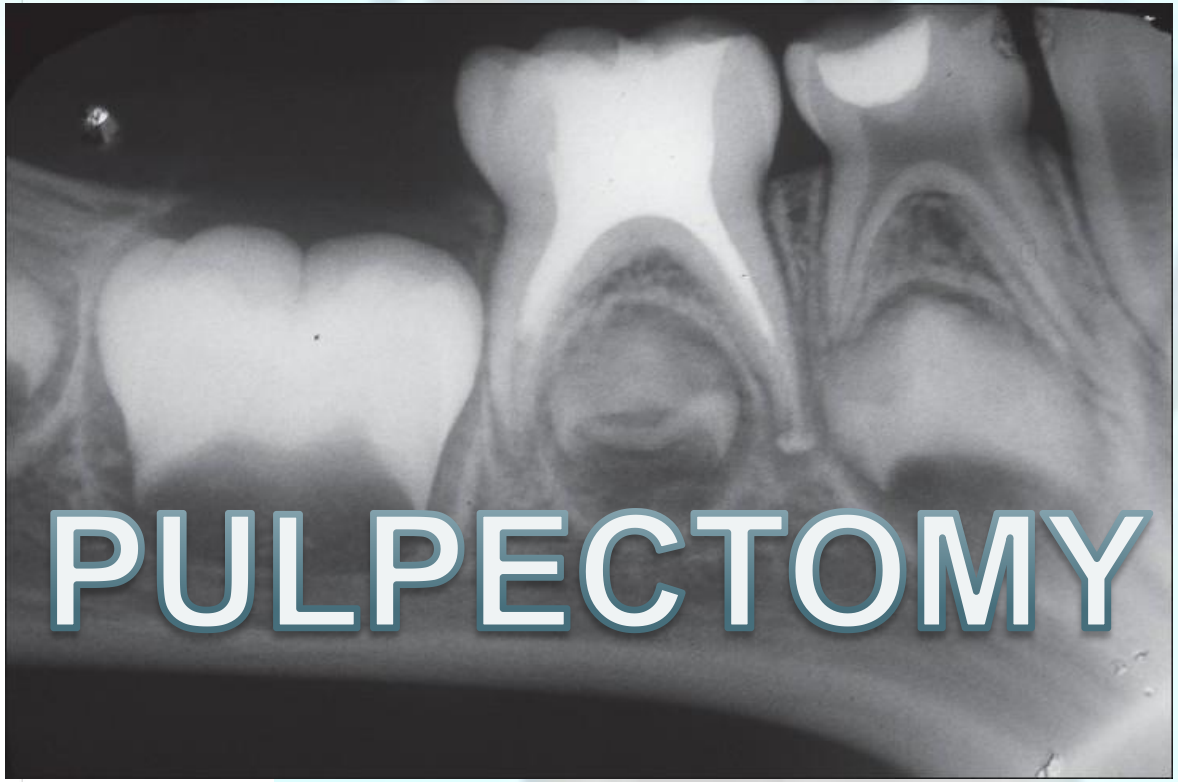
- Conclusion
- References

To be continued…..


Thank You


Good Morning

Non-vital pulp therapy in pediatric dentistry



CONTENTS

Grossman method

- actual length of tooth is determined by mathematical formula

- Actual length of tooth =

  $$\frac{\text{actual length of the instrument} \times \text{x-ray length of tooth}}{\text{x ray length of instrument}}$$

Grossman method

- Actual length of tooth =

  $$\frac{\text{actual length of the instrument} \times \text{apparent length of tooth in radiograph}}{\text{apparent length of instrument in radiograph}}$$

Root canal Irrigants & Medicaments

Man does not live by bread alone

Root canals are not cleaned by instruments alone but with important adjuncts like irrigants

Biological Preparation - Irrigation

- ***Marsh and Largent (1967)*** –Irrigation serves as a physical flush to remove debris, pulp tissue, microorganisms as well as serving as a **bactericidal agent, tissue solvent and lubricant**

AUTHOR	DESCRIPTION
Kopel	Debridement in primary teeth- more dependant on chemical than mechanical means
Braham Morris	Prim molars –hourglass in shape Instrumtn + irrigation

Ideal Properties

- **Walton & Torabinejad 1989**
  - Tissue solvent
  - Low toxicity
  - Low surface tension
  - Lubricant property
  - Sterilization
  - Flushing action
  - Removal of smear layer
  - Availability
  - Cost effective

Ideal Requirements of Root Canal Irrigants

Irrigating Solutions in Pediatric Dentistry:
Literature Review and Update
Rajwinder Kaur et al 2014

Ideal Requirements of Root Canal Irrigants

1. Broad antimicrobial spectrum
2. High efficacy against anaerobic and facultative microorganisms organized in biofilms.
3. Ability to dissolve necrotic pulp tissue remnants
4. Ability to inactivate endotoxin
5. Ability to prevent the formation of a smear layer during instrumentation
6. Systemically nontoxic.

ENDODONTIC IRRIGANTS

CHEMICAL AGENTS

TISSUE DISSOLVING AGENT

(Eg; NaOCl ,ClO2

ANTIBACTERIAL AGENT

1. Bactericidal (eg CHX)
2. Bacteriostatic(eg; MTAD)

CHELATING AGENT

MILD pH (HEBP)

STRONG pH (EDTA)

NATURAL AGENTS

ANTIBACTERIAL AGENT

(eg; green tea ,triphala,Propolis)

J Conserv Dent. 2010 Oct-Dec; 13(4): 256–264

Fernanda Miori Pascon et al, Influence of cleansers and irrigation methods on primary and permanent root dentin permeability: a literature review. Braz J Oral Sci. July-September 2006 - Vol. 5 - Number 18

Category	Agents		Ingredients	Major Advantages(s)
Antiseptic and/or Disinfectant	Sodium Hypochlorite		0.5-5.25% available chlorine	Tissue dissolution and antimicrobial
	Chlorhexidine Gluconate		0.1-2.0% Chlorhexidine Gluconate	Antimicrobial
Oxidizing agents	Hydrogen Peroxide		3% Hydrogen Peroxide	Effervescence with NaOCl (beneficial effect in the canal questionable)
	Urea Peroxide	Endo-PTC	10% Urea Peroxide, 15% Tween 80 and 75% Carbowax	Good wetting ability, excellent lubricant
		Gly-Oxide	10% Carbamide peroxide in glycerol	
Chelating agent	EDTA		10–17% recommended	Softens dentine and removes (partially) smear layer
	EDTAC		EDTA with Cetrimide/Cetavlon	Good wetting ability for EDTAC preparations
	RC-Prep		EDTA and Urea Peroxide in a base of carbowax	Excellent lubricant
Organic Acid	Citric acid		10-50% recommended	Removes smear layer
	Polyacrylic acid		5-20% recommended	
	Tannic acid		25% solution	

Other Different irrigants

Root canal irrigants in primary teeth
Jaya agali Ramachandra et al
World jnl of dentistry 2015

Irrigating Solutions in Pediatric Dentistry: Literature Review and Update
Rajwinder Kaur et al 2014

NaoCl-0.5%-5.25%
CHX -.0.2% & 2%
EDTA -17%
Citric acid -6%
Mixture of Doxycycline,citric acid and a detergent
Tetraclean(acid+antibiotic+detergent)
Carisolv
Electrochemically activated solutions
Ozonated water
Herbal irrigants
Miswak
Morinda citrifolia
Triphala and Green tea phenols
German chemomile and Tea tree oils
Propolis

Hydrogen peroxide
Maleic acid 7%
Chlorine dioxide
Smearclear-(17%EDTA solution along with centrimide and additional proprietary surfactants.)

NaOCl

Pashely et al 1985	**It is found that 5.25% NaOCl has a greater cytotoxicity and caustic effects than with 0.5% and 1% solution.**
Berber et al 2006 (0.5%, 2.5% and 5.25	anals and for all techniques the most effective irrigant OCl
JEFFERSON J.C MARI et al 2012	tion than and others because it and 1% con centration and has **tration .**

- Swallowed unintentionally- pharyngeal oedema & oeaphageal burns
- Pushed beyond apex
- Taste
- Irritant
- Damage to clothes

CHX

White *et al.* -- CHX + NaOCl	substantivity of CHX tissue dissolving action of NaOCl
Dametto *et al.* *2005*	2% chlorhexidine gluconate (gel and liquid) antimicrobial ability more effective than 5.25% NaOCl in preventing regrowth of *E. faeca*
Oncag et al (JCPD 2006)	In vivo eff Ca(O 1% C 1% C CHX with / without $Ca(OH)_2$ -- more effective than $Ca(OH)_2$ alone

- unable to dissolve organic matter or pulp tissue
- does not remove smear layer

EDTA

Hariharan et al 2010	**With the use of EDTA in primary teeth, he observed minimal erosion in peritubular dentin .This is due to higher volume of EDTA.**
Navid K et al 2014	**17% EDTA application for one min proved no signs of dentin erosion**

Saline

Irrigation with distilled water or saline (Walker and del Rio, 1991).	**Is effective in eliminating loose debris from upper and middle thirds of canal but has mild effect on smear layer**
Hariharan et al JISPPD 2010	Saline group Sodium hypochlorite group NaOCl + EDTA Citric acid CHX The study concluded that superior efficacy of 6%citric acid in removal of smear layer than any other tested irrigants in primary root canals.

TABLE 1. Overview on the features of aqueous irrigants frequently recommended for endodontic use

Compound (recommended concentration)	Type	Action on Endodontic Taxa Biofilm	Tissue Dissolution Capacity	Endotoxin Inactivation	Action on Smear Layer	Caustic Potential	Allergic Potential
Hydrogen peroxide (3%–30%)	Peroxygen	+	–	–	–	D. o. c.	–
Sodium hypochlorite (1%–5.25%)	Halogen-releasing agent	++	+++	+	++ on organic compounds	D. o. c.	+
Iodine potassium iodide (2%–5%)	Halogen-releasing agent	++		N. i. a.	–	–	++
Chlorhexidine (0.2%–2%)	Bisguanide	++	–	+	–	D. o. c.	+
Dequalinium acetate (0.5%)	Quaternary ammonium compound	N. i. a.	–	N. i. a.	+	–	++
Ethylenediamine tetraacetic acid (10%–17%)	Polyprotic acid	+	–	–	++ on inorg. compounds	–	–
Citric acid (10%–50%)	Organic acid	–	–	–	+++ on inorg. compounds	–	–

–: absent or minor, +: reported, ++: definitely present, +++: strong, D. o. c.: depending on concentration, N. i. a: no information available.

Table 4. Individual results of individual studies.

Study	Initial sample	Irrigant agent	Final sample	Evaluation period	Success of treatment	Failure of treatment	Mean	SD	Response variable	Results	Conclusion
Ruiz-Esparza *et al.*[32] JCPD 2011	20 20 20 20	Saline solution 2% Chlorhexidine gluconate	20 20 20 20	Pre-irrigation Post-irrigation Pre-irrigation Post-irrigation	ND	ND	1.68×10^{9} 1.06×10^{9} 1.5×10^{9} 1.5×10^{6}	4.7×10^{7} 4.6×10^{7} 5.2×10^{7} 4.6×10^{6}	Colony-forming units (CFU/mL)	Statistically significant difference was observed in favour of the experimental group	Chlorhexidine gluconate showed greater reduction of intracanal bacterial loading
Louwakul&Pruck-satha-mrongkul[33] PD 2012	32 32	Saline solution 2% Chlorhexidine gluconate	30 30 30 31 31 31	6 months 12 months 18 months 6 months 12 months 18 months	25 28 29 31 30 28	5 2 1 0 1 2	ND	ND	Success and failure, radiographic and clinical criteria	At 6 months in favour of experimental group and no difference at 12 or 18 months	Chlorhexidine 2% could improve the results 6 months after intervention
Valdez-González, *et al.*[34] PD 2012	20 20 20 20	NaOCl 1% OPW	20 20 20 20	Pre-irrigation Post-irrigation Pre-irrigation Post-irrigation	ND	ND	1.56×10^{9} 0 1.63×10^{9} 5×10^{7}	3.36×10^{8} 0 4.18×10^{8} 1.53×10^{8}	CFU/mL	Significant difference in favour of the experimental group when evaluated pre- and post-irrigation	OPW was as effective as NaOCl

Study	Initial sample	Irrigant agent	Final sample	Evaluation period	Success of treatment	Failure of treatment	Mean	SD	Response variable	Results	Conclusion
Jolly *et al.*[35] JCPD 2013	15	Saline solution	15	Pre-irrigation Post-irrigation	ND	ND	Aerobes (7.13) Anaerobes (7.4) Aerobes (3.8) Anaerobes (6.40)	1.19 1.24 1.08 0.91	CFU/mL	In all groups, a significant decrease in mean aerobic CFU was observed; maximal change in anaerobic CFU count was observed with 2% chlorhexidine	Chlorhexidine proved to be a superior antimicrobial agent against both endodontic aerobes and anaerobes
	15	Chlorhexidine gluconate 2%	15	Pre-irrigation Post-irrigation			Aerobes (7.13) Anaerobes (7.2) Aerobes (3.8) Anaerobes (3.73)	1.19 1.26 1.08 0.88			
	15	Calcium hydroxide 4%	15	Pre-irrigation Post-irrigation			Aerobes (7.13) Anaerobes (7.13) Aerobes (5.73) Anaerobes (5.27)	1.19 1.19 1.49 1.16			
	15	Propolis extract 4%	15	Pre-irrigation Post-irrigation			Aerobes (6.93) Anaerobes (7.27) Aerobes (3.87) Anaerobes (4.40)	1.58 1.28 1.19 1.12			
Tulsani *et al.*[7] PD 2014	10 15 15	Isotonic saline solution 0.9% 2.5% NaOCl MTAD (Bio-pure)	10 15 15	Post-irrigation	ND	ND	2.09 0.23 0.19	1.54 0.34 0.40	Relative Quantifying (RQ) increase in gene expression	Statistically significant difference between NaOCl and MTAD against control was found, but no difference was found between the experimental groups	Both irrigants (NaOCl and MTAD) were effective against *E. faecalis*

Study	Initial sample	Irrigant agent	Final sample	Evaluation period	Success of treatment	Failure of treatment	Mean	SD	Response variable	Results	Conclusion
Verma *et al.*[36]	35	Isotonic saline solution 0.9%	35	Pre-irrigation Post-irrigation	ND	ND	ND	ND	CFU/mL	Greater reduction in bacterial colony counts isolated in the Propolis group compared with the control group	The water–soluble propolis extract 25% can be used as an irrigant
JISPPD 2014	35	Water- soluble propolis 25%	35								
Farhin *et al.*[37]	30	NaOCl 1%	30	Pre-irrigation	ND	ND	111301.7	10.80×10^3	CFU/mL	Group (NaOCl) showed significant decrease in bacterial load; the same in the MTAD group; when both groups were compared in post-irrigation, MTAD was superior	The results presented in this study are very promising in terms of being a viable alternative
	30		30	Post-irrigation			354.25	18.73×10^3			
	30	MTAD	30	Pre-irrigation			105873.5	11.82×10^3			
JCPD 2015	30		30	Post-irrigation			183.09	59.14×10^3			

Recent advances in irrigants

Parul Singhal, Usha Mohan Das, Deepak Vishwanathan et al 2012	**Carislov as an endodontic irrigant in deciduous teeth:An SEM study** Root canals were flooded with NaOCl solution in Group A, NaOCl gel in Group B and Carisolv ™ in Group C and incubated for 30 min NaOCl solution was better followed by carislov and NaOCl gel
Zeynep Goztas et al 2014 Group I: 25 mg/L of Ozonated water, Group II: 2.5% (NaOCl), Group III: 2% CHX	**Antimicrobial activity** was similar for all groups Due to **aqueous ozone** that **demonstrates no cytotoxicity and high biocompatibly** can be used as primary root canal irrigation agent for especially pediatric patient.

Shilpi Gupta et al 2015 JCMD	Smear layer removal in primary teeth using a novel irrigant, **QMix:** An in vitro study. QMixTM (2 in 1 solution a mixture of (CHX), (EDTA) and a surfactant cetrimide mixed in distilled water with acceptable additional salt) QMixTM is effective as a final irrigation agent for the **removal of smear layer** in the coronal, middle, and apical thirds of the root canals in **deciduous teeth**
Sharath Asokan Et al IJCPD 2016	Effect of 95% Ethanol as a Final Irrigant before Root Canal Obturation in Primary Teeth: An in vitro Study Primary root canals dried with **95% ethanol showed better obturation** than those dried with paper points.

New Technologies to Improve Root Canal Disinfection

Brazilian Dental Journal (2016)

Disposable plastic syringes of 2.5-5ml capacity with 25 gauge blunted needles

Sodium Hypochlorite (NaOCl)-

To reduce this risk, use of specially designed endodontic needles and a technique of injection without pressure are recommended

Specially designed needles

Max-I-probe

NaviTip

Ultrasonic Activation of Sodium Hypochlorite-between 25 and 40 kHz & 30 s to 1 min for each canal with 3 cycles of 10-20 s

Agitation techniques:

Manual Agitation Techniques

Machine-Assisted Agitation Systems

Continuous Irrigation during Instrumentation

Sonic Activation lower frequency (1-6 kHz)

Apical Negative-Pressure Irrigation(EndoVac)

Laser Activation

Additional Disinfection Systems

Photo-Activated Disinfection (PAD)

Ozone

Alternative Antibacterial Systems

Nanoparticles

Bioactive Glass

Natural Plant Extracts

Seow et al 1991 PD	Comparison of ultrasonic and mechanical cleaning of primary root canals using a novel radiometric method --ultrasonication is a useful adjunct for endodontic cleaning of primary teeth. Due to the high prevalence of accessory canals

Obturation

OBTURATION

- DEFINITION

It is the substitution of an filling in the space previously occupied by the pulp tissue, to prevent recurrent infection by way of the circulation (anachoresis) or through a break in the integrity of the crown of the tooth

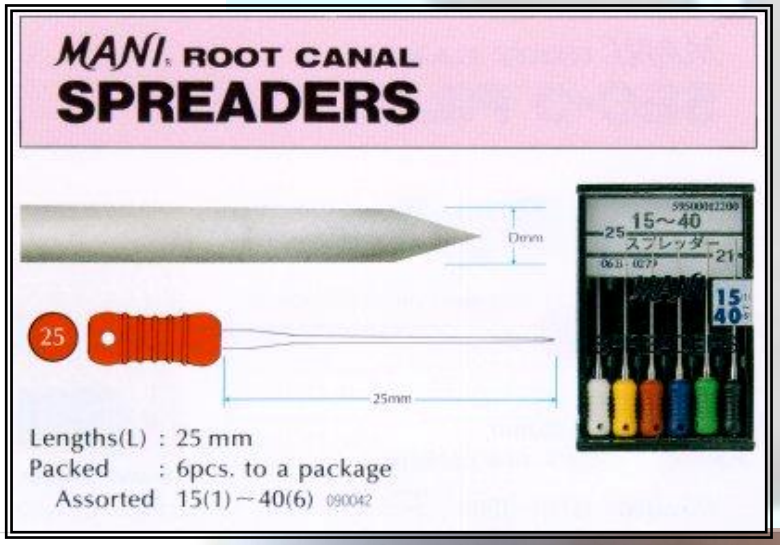
- Resorbable cements used in primary teeth
- Guttapercha and silver points are contraindicated

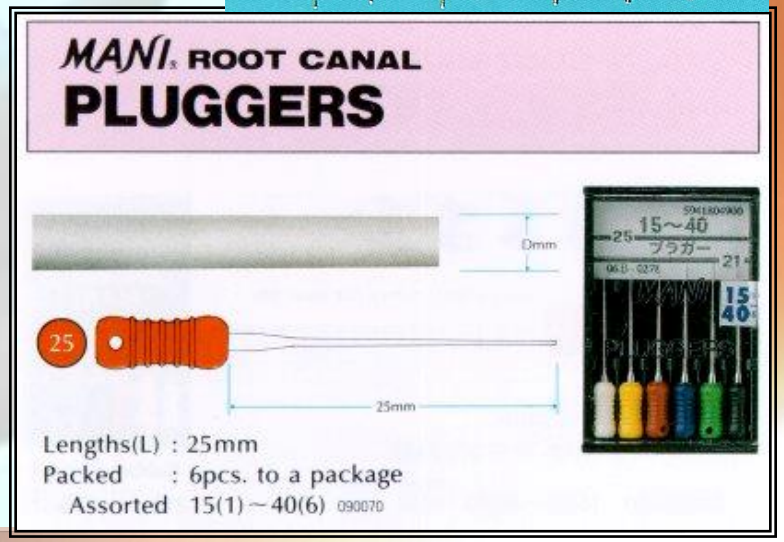
Criteria For Ideal Root Canal Filling Material
Castagnola et al, Rifkin et al

- Resorbable
- Antiseptic
- Harmless to adjacent tooth germ
- Radio opaque
- Does not set to a hard mass-deflect succedaneous teeth
- Easily inserted
- Easily removed if necessary
- Non inflammatory
- Not discolour tooth

Instruments For Obturation

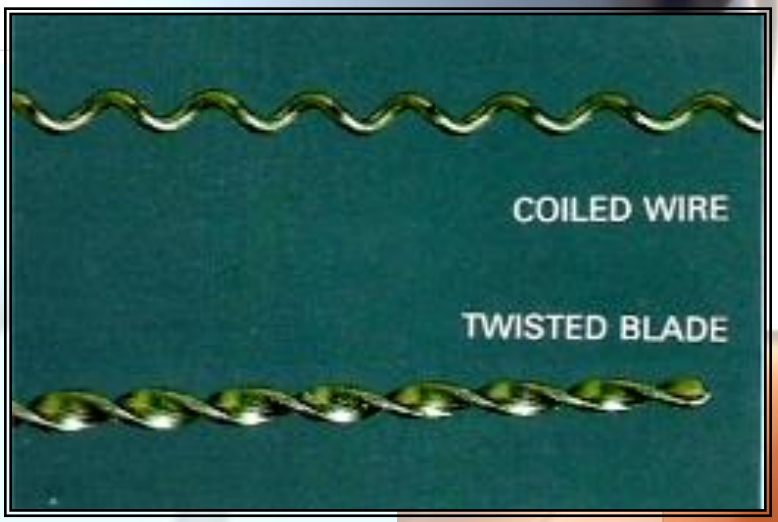
- Endodontic pluggers & spreaders
  - Hand held
  - Finger held- Ni Ti (HyFlex)

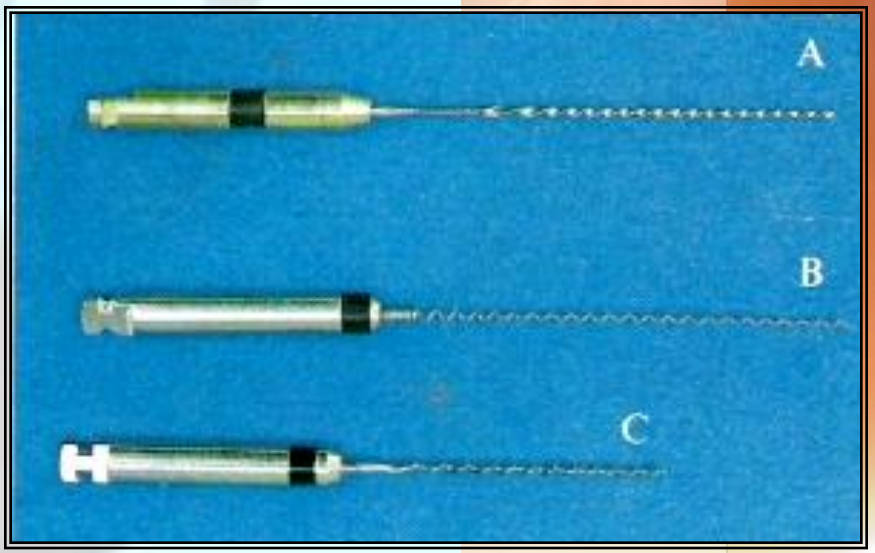




Lentulospirals

- ISO group II
- Must fit loosely
- 3 types
  - Coiled
  - Twisted blades
  - Coiled with safety device





MATERIALS USED FOR OBTURATION

- Zinc oxide eugenol
- Calcium hydroxide
- Iodoform
- Vitapex
- Walkhoff paste
- KRI paste
- Maisto paste
- Mineral trioxide aggregate
- Endoflas

Zinc Oxide Eugenol

- First discovered Bonastre(1837)
- Dentistry-Chisholm(1876)

- Resorbable
- Radioopaque
- Most popularly used
- Composition
  - Powder
    - **Zinc oxide 42%**
    - **Staybelite resin 27%**
    - **Bismuth carbonate 15%**
    - **Barium sulphate 15%**
    - **Sodium borate 1%**
  - Liquid
    - **Eugenol**

DISADVANTAGES

(Kennedy)	Sets into hard mass- deflection of succedaneous teeth
(Erausquin & Muruzbal)	Irritating to periapical tissue
(Allen & Woods)	Necrosis of bone and cementum Longer time to resorb than tooth root
(Barker)	Foreign body reaction if overfilled
CASES et al	ZOE treated teeth were retained longer
FUKS 2000 DCNA	diff resorption rates when pushed apically
MORTAZAVI (2004) COLL et al	resulted in deflected permanents

Success rates reported after obturating with Zinc Oxide Eugenol cement by various authors as follows

Gould et al	**82.5%,**
Coll et al.	86.1%
Holan and Fuks	65%,
Reddy V.V.S. and Fernandes	80%,
Nadkarni and Damle	88.57%
Mortzavi and Mesbahi (2004)	78.5%
Barr et al	82.3%

Zinc Oxide-Eugenol paste retained in gingival mucosa after primary teeth pulpectomy

P. Nivoloni Tannure et al
EJPD-2010

FIG. 1 - *The slightly short root canal filling in primary incisors and 12 months after pulpectomy*

FIG. 2 - *Radiographic and clinical exams: ZOE retained in gingival vestibular area.*

Periodic clinical and radiographic evaluation should be performed

Calcium Hydroxide

- Herman 1930
- Stimulates dentin formation when contacts pulp tissue
- Used mainly for apexogenesis & apexification
- Resorption ability of the material --alternative for primary teeth root canal filling
- Not used in pulp therapy for primary teeth, due to the frequent occurrence of internal root resorption
- Well tolerated periapically, causing some degree of apical hard tissue deposition
- Mainly serves as an intracanal medicament

Chawla et al 2000	**ZOE Vs Calcium hydroxide** **Delayed resorption compared to normal physiologic resorption – ZOE** **High success rate – 86.7% with CaOH**
Nadkarni & Damle 2000	Calcium hydroxide & ZOE: Faster resorption of overfilled CaOH than ZOE

OTHER OBTURATING MATERIALS IN PRIMARY TEETH

KRI PASTE

- Wright K J -84%
- Holan – 100%
- Garcia –Godoy- 95.6%
- Rifkin – 89.5%
- Fuks -84% - Kri paste group

  65% - ZOE group

  Overfills

  Kri paste - 79% success

  41% success with ZOE

MAISTO PASTE

REDDY VVS & FERNANDES

Maistos paste -100%

ZOE – 80%

- Bone regeneration
  - Maistos paste - 93%
  - ZOE - 26.7%
- Mass & Zilberman
  - Modification of Maisto's paste –High ZnO reagent
  - Successful in badly infected molars

ENDOFLOS

Resorbs extra-radicularly

Discoloration

Eugenol causes irritation

Hydrophillic

- Fuks

under filled 83% success

overfilled-58%

VITAPEX

Mortazavi & Mesbahi (2004)

- Vitapex - 100%
- ZOE - 78.5%

Physiological root resorption and resorption of vitapex occurred simultaneously

(Trairatvorakul 2008):

Vitapex appears to resolve furcation pathology than ZOE **78% vs 48%,**

opaque

voids

CG Sarigol et alJ Dent Child 2010	**Cytotoxic effects of primary tooth root canal filling materials on L929 cell line.** **Kri 1 paste as a root canal filling material is a better option than other medications in primary teeth**
Ramar K, Mungara (2010)	Studied was undertaken to evaluate clinically and radiographically the efficacy of three obturating materials – METAPEX, RC FILL and ENDOFLAS for a period of 9 months. ENDOFLAS -95.1%, METAPEX – 90.5% and RC FILL – 84.7%.
Gupta S, Das 2011	**Metapex – gradual & almost complete reduction in preoperative signs and symptoms and a faster resorption of overfilled material than ZnOE**
Nivedita Rewal et al JISPPD 2014	Comparison of Endoflas and Zinc oxide Eugenol as root canal filling materials in primary dentition Endoflas with a success rate of 100% is a much better material compared with zinc oxide eugenol

PROPERTIES	ZOE	$Ca[OH]_2$ with Iodoform [VITAPEX]	KRI paste
1. Resorbs at the same rate as the tooth.			
2. Harmless	Y	Y	Y
3. Overfill resorbs		Y	Y
4. Antiseptic	Y	Y	Y
5. Easily applied		Y	Y
6. Adheres to the wall	Y	Y	Y
7. Easily removed		Y	Y
8. Radiopaque	Y	Y	Y
9. No discolouration	Y	Y	Y

Omar A Bawazir et al 2007	**Apical microlekage of primary teeth root canal filling materials** **Increased ZOE** **Decresed vitapex**
Chawla et al. 2008 JISPPD	Evaluation of mixture of ZnO ,CaOH,and NaF as a new root canal filling material in primary teeth Same rate resorption NaF-effect on permanent tooth
S Asokan et al 2012 J Dent Child	volumetrically analyzed the efficacy of root canal fillings in primary teeth using spiral computed tomography (CT). VOIDS: Vitapex – 95% obturated volume Metapex – 88% ZOE – 84%
SAUMYA NAVIT et al 2016	Antimicrobial Efficacy of Contemporary Obturating Materials used in Primary Teeth- An In-vitro Study Endoflas > ZOE >Calcium hydroxide + Chlorhexidine > Calcium hydroxide + Iodoform +Distilled water ~ Metapex
Alaa O Al-Ostwani Et al JISPPD 2016	A clinical and radiographic study of four different root canal fillings in primary molars ZOP is a promising paste with its natural antibacterial component (propolis).

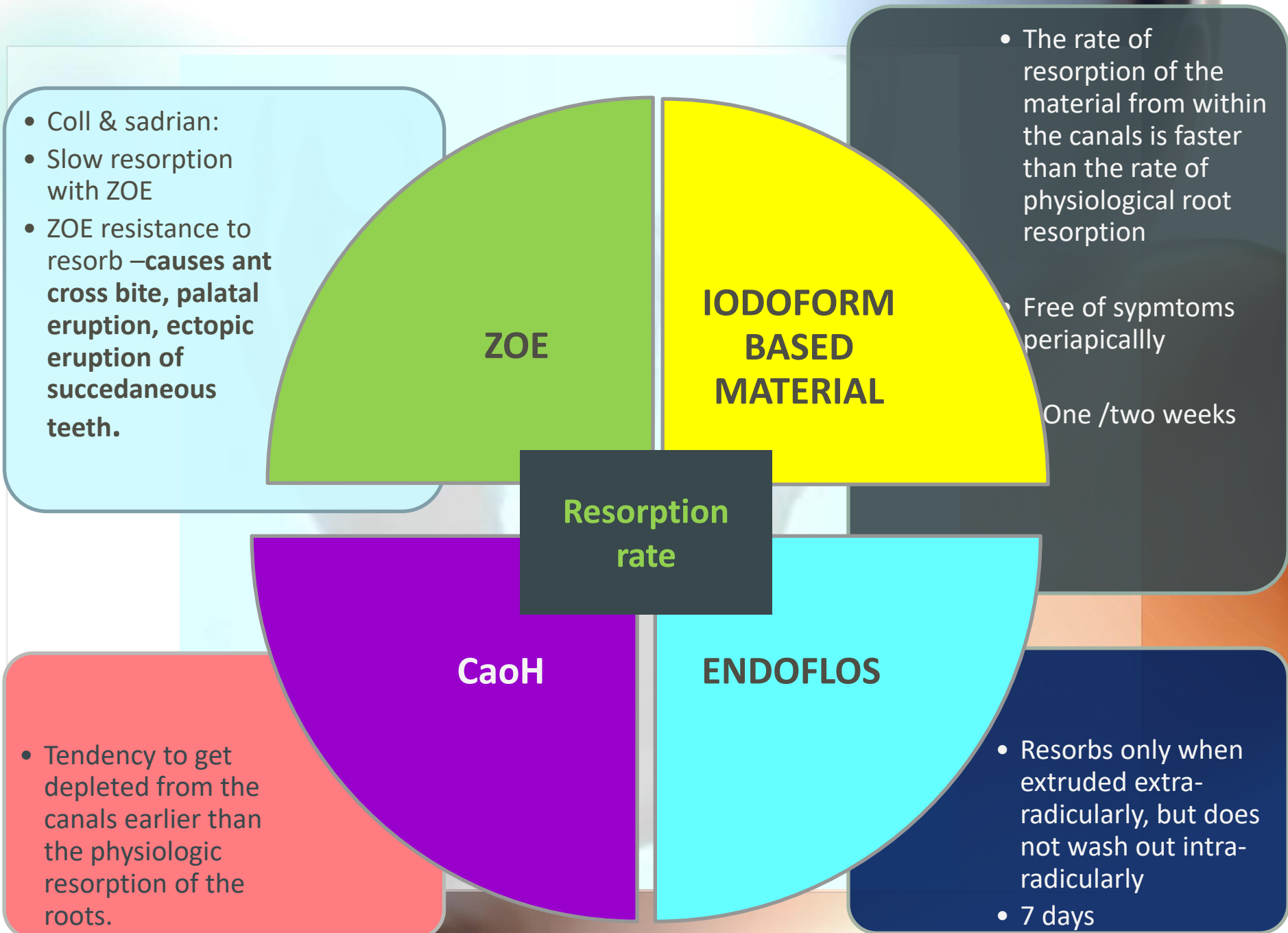

Resorption rate
ZOE
IODOFORM BASED MATERIAL
CaoH
ENDOFLOS
• Coll & sadrian:
• Slow resorption with ZOE
• ZOE resistance to resorb –**causes ant cross bite, palatal eruption, ectopic eruption of succedaneous teeth.**
• The rate of resorption of the material from within the canals is faster than the rate of physiological root resorption
• Free of sypmtoms periapicallly
One /two weeks
• Tendency to get depleted from the canals earlier than the physiologic resorption of the roots.
• Resorbs only when extruded extra-radicularly, but does not wash out intra-radicularly
• 7 days

Table 2: Comparison of studies on calcium hydroxide/iodoform root filling paste

JISPPD -2014

References	Type of RC filling paste	Number of teeth	Follow-up period	Paste resorption	
				Extraradicular	Intraradicular
Ramar and Mungara[15]	Metapex®	30 teeth	9 months	2 teeth	17 teeth
Ozalp *et al.*[2]	Vitapex®	20 teeth	18 months	7 teeth (resorption of overfilled canal)	6 teeth needed retreatment
Howley *et al.*[7]	Vitapex®	37 teeth	Up to 23 months	10 teeth	All 37 teeth
Mortazavi and Meshbahi[13]	Vitapex®	26 teeth	10–16 months	10 teeth	None
Nurko and Garcia-Godoy[12]	Vitapex®	33 teeth	Up to 3–22 months	2 teeth	17 teeth
Trairatvorakul and Chunlasikiwan[11]	Vitapex®	27 teeth	Up to 12 months	15 teeth	19 teeth
Subramaniam *et al.*[17]	Metapex®	18 teeth	Up to 18 months	Not mentioned	Not mentioned
Nakornchai *et al.*[14]	Vitapex®	25 teeth	Up to 12 months	N/A	14 teeth – partial resorption
Mani *et al.*[18]	Pulpdent®	30 teeth	6 months	11 teeth (resorption of overfilled canals)	13 teeth (3 patterns of material resorption noted) From apical portion of canals In vertical generalized pattern From pulp chamber area
Nadkarni and Damle[19]	Paste made from $Ca(OH)_2$ powder	35 teeth	Up to 9 months	4 teeth (resorption of overfilled canals) at 3 months only	Not mentioned

RC: Root canal

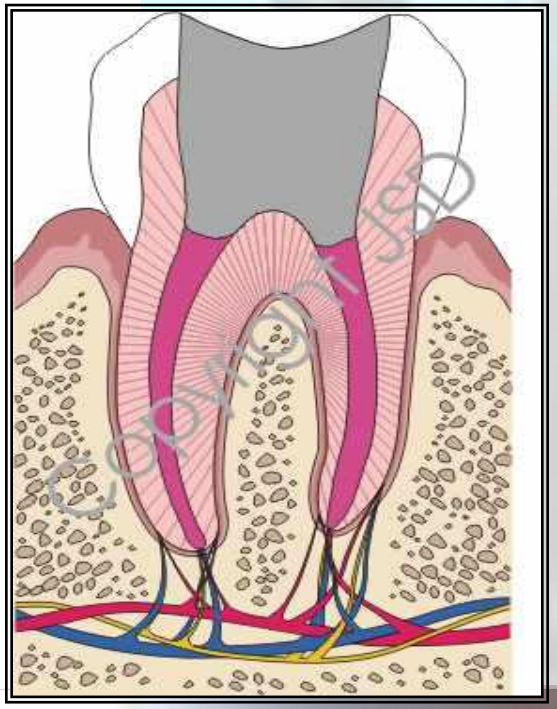

“At times we have a many options but we have to choose the best among them”

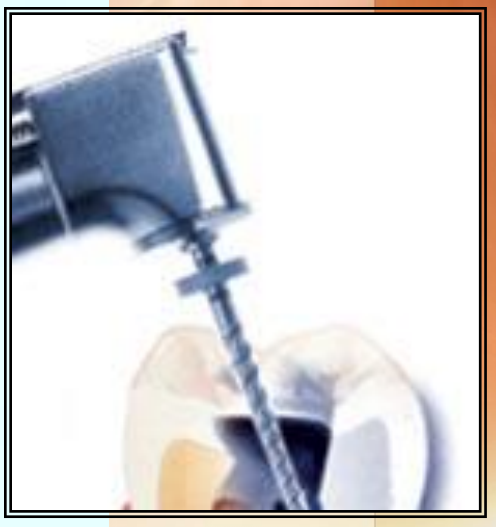
Obturation techniques

Ideal Filling Technique

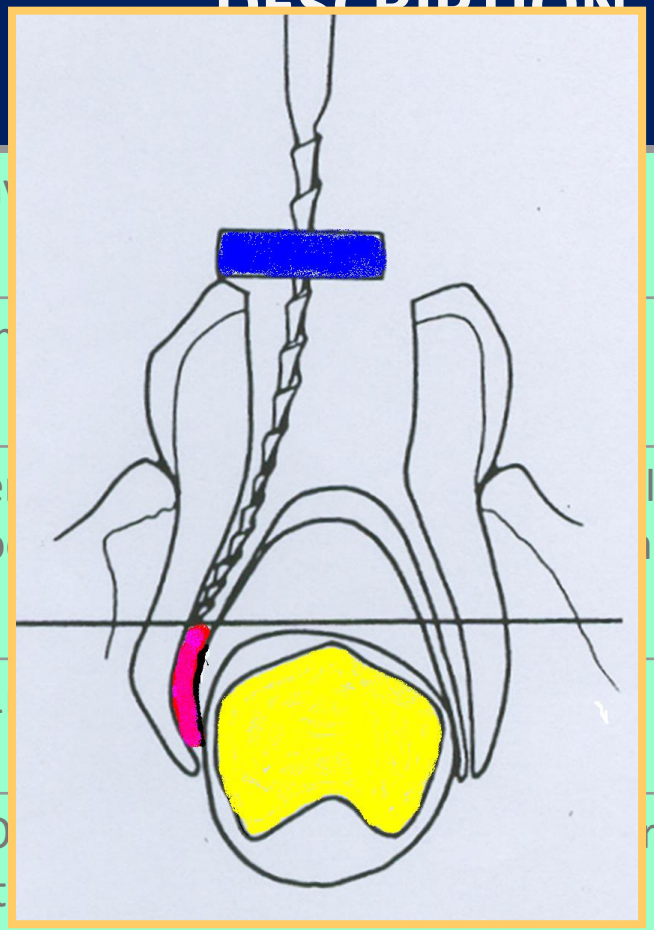
- Should assure complete filling of the canal without overfill and with minimal number of voids

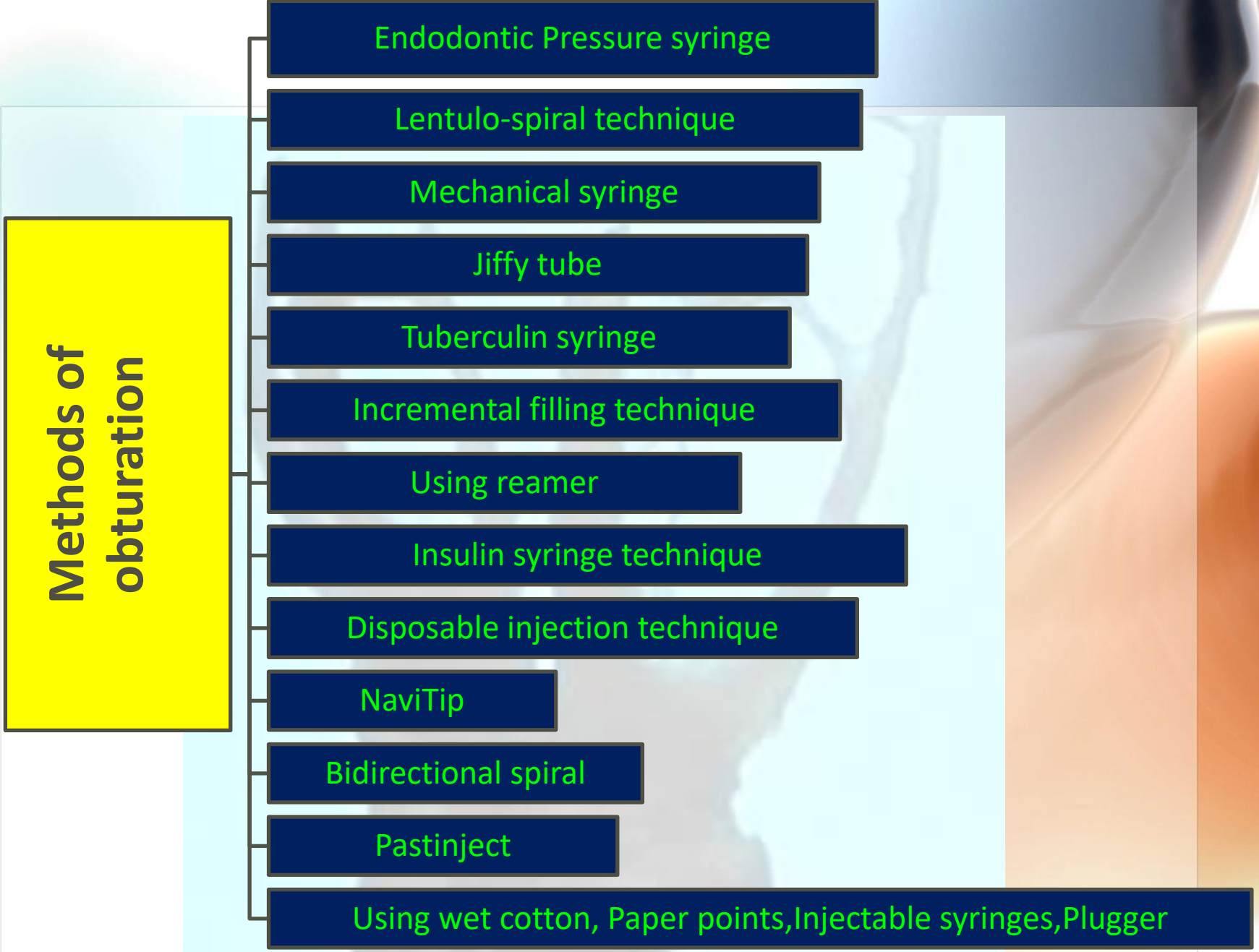
Guelmann et al





AUTHOR	DESCRIPTION
Groter(1967)	av
Spedding (1973)	in
Garcia-Godoy (1987)	e o level of germ
Flaitz et al (1989)	1
S Gupta 2011	O it roughout





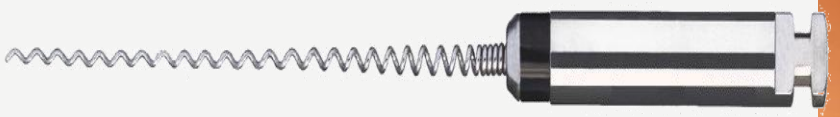
Mahajan et al: Obturation techniques in primary teeth IJMDS 2015

Endodontic Pressure Syringe

- Greenberg (1963)
- This apparatus consists of a syringe barrel, threaded plugger, wrench and threaded needle.
- Flexible needle
- Tortous canals

Using lentulo spirals

- Kopel in 1970.
- Hand lentulo spiral and engine driven
- The design and flexibility of the Lentulo spiral allow files to carry the paste uniformly throughout the narrow, curved canals in primary molars.

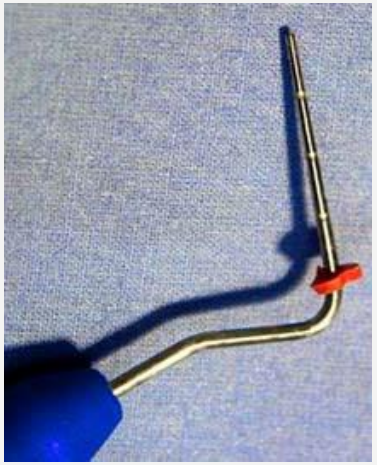


Mechanical Syringe

- Greenberg (1971)
- Poor in straight and curved canals

Incremental filling technique

- Gould in 1972.
- described a method of placing the material in bulk and pushing it into the canals with endodontic pluggers with rubber stop.



Jiffy tube

- Riffcin (1980)
- The standardized mixture of ZOE is back-loaded into the tube.

Tuberculin syringe

- Aylord and Johnson in 1987.
- The standardized mixture of ZOE was backloaded into the syringe with a standard 26gauge, 3/8-inch needle.

The Reamer Technique

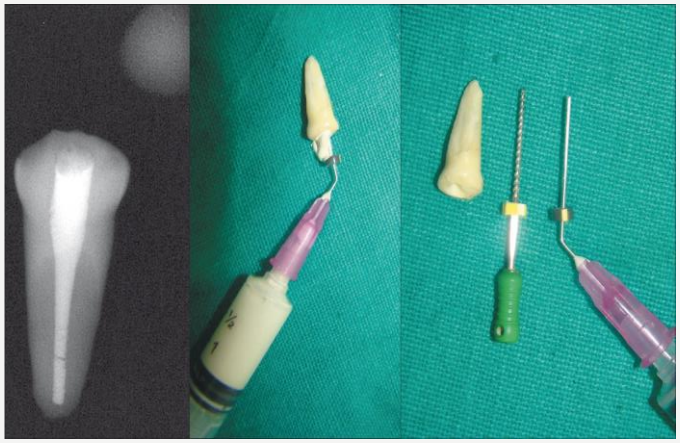
- Priya Nagar (2011)
- A reamer coated with ZOE paste was inserted into the canal with the stopper
- 1st – clockwise 2nd - vertically up and down 3rd –anticlockwise
- The process was repeated 5 to 7 times for each canal until the canal orifice appeared filled with the paste

The Insulin Syringe Technique

- Priya Nagar (2011)
- The material is loaded into the insulin syringe and a stopper is used. The needle is inserted into the canal and kept about 2mm short of apex
- helps avoid incorporation of voids into the canal.

Disposable Injection Technique

- Bhandari (2012)
- ZOE can be loaded in a 2-ml syringe with 24-gauge needle along with stopper
- The technique described is simple, economical,



NaviTip

- Guelmann (2004)
- This NaviTip comes in different lengths and a rubber stop may be adjusted to it.
- NaviTip syringe produced the best results in **controlling paste extrusion from the apical foramen**

Bi-Directional Spiral

- Dr. Barry Musikant [1998]
- This controlled coverage is achieved because the spirals at the coronal end of the instrument spin the material down the shaft towards the apex, while the spirals at the apical end spin the material upward towards the coronal end.
- The highest number of voids

Pastinject

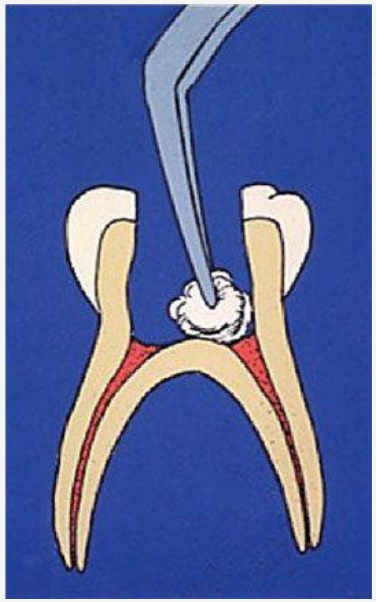
- Guelmann (2004)
- Pastinject (Micromega) is a specially designed paste carrier with flattened blades, which improves material placement into the root canal.
- Higher number of optimally filled canals and minimal voids

Obturation using injectable syringes

- The syringe loaded with the obturating material is taken inside the canal and continuously withdrawing the syringe from the canal.

Using wet cotton

- Hartman and Pruhs
- a small wet cotton pellet
- 5-8 times.
- Pressure - each canal



Amalgam plugger - Nosonwitz(1960) and King (1984)

Paper points by Spedding (1973)

Pastinject seems to be more preferred than other methods as concluded from various studies

Metarpour et al 2013	**Lentulo-best in length of obturation** **NaviTip-best in controlling extrusion, decreased voids** **Tuberculin-worst in length of obturation**
Grover et al 2013	**Pastinject: optimally filled with good success rate** **Bi-directional:underfilled** **Pressure syringe:overfilled**
Tan J M E et al 2013	Specially designed paste carrier technique Autoclavable needles Large diameter Decreased extrusion
Hiremath et al 2016	Endodontic Pressure syringe:95.8% Insulin syringe: 79.2% LA syringe:66.7% Jiffy tube-37.5%

TWO stages

One- stage- single -visit pulpectomy

Multi visit pulpectomy

INDICATIONS

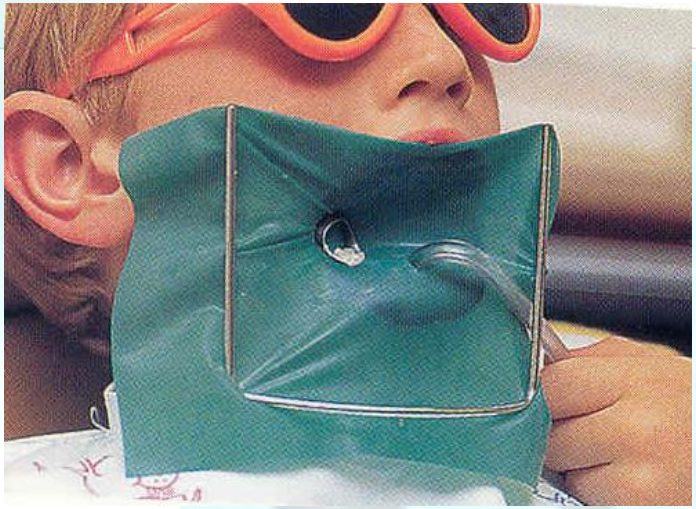
for Single visit pulpectomy

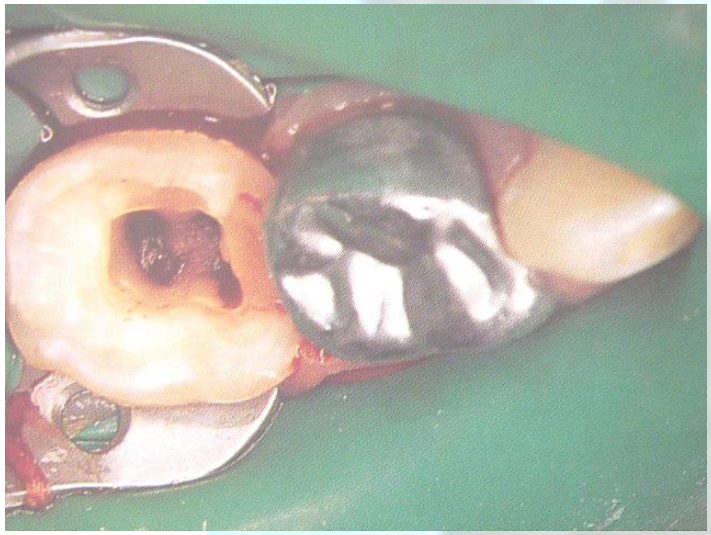
- **Vital** primary teeth but with inflammation extending beyond coronal pulp.
- Indicated by hemorrhage from the amputated radicular stump that is dark red,a slowly oozing and **uncontrollable**.

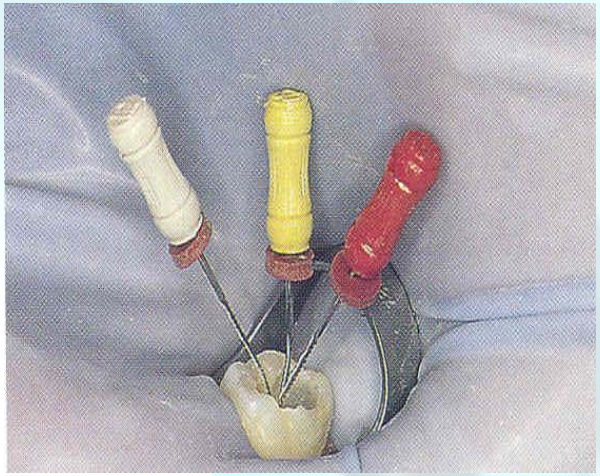
for multi visit pulpectomy

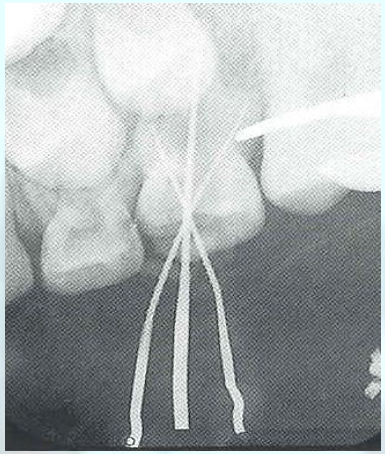
- (Paterson & Curzon in 1992)
- Indicated where infection, an abscess or chronic sinus exists
- Non-vital primary teeth
- Teeth with necrotic pulp and periapical involvement

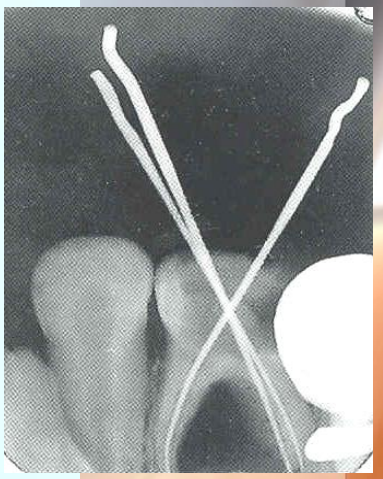
Single visit pulpectomy

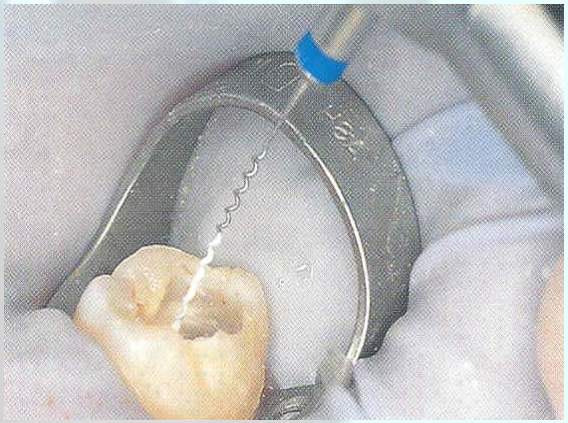


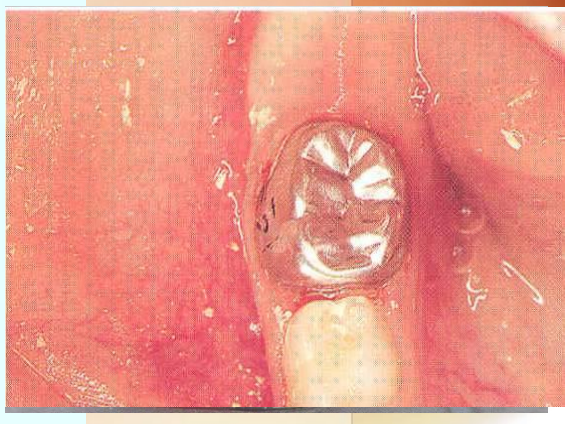




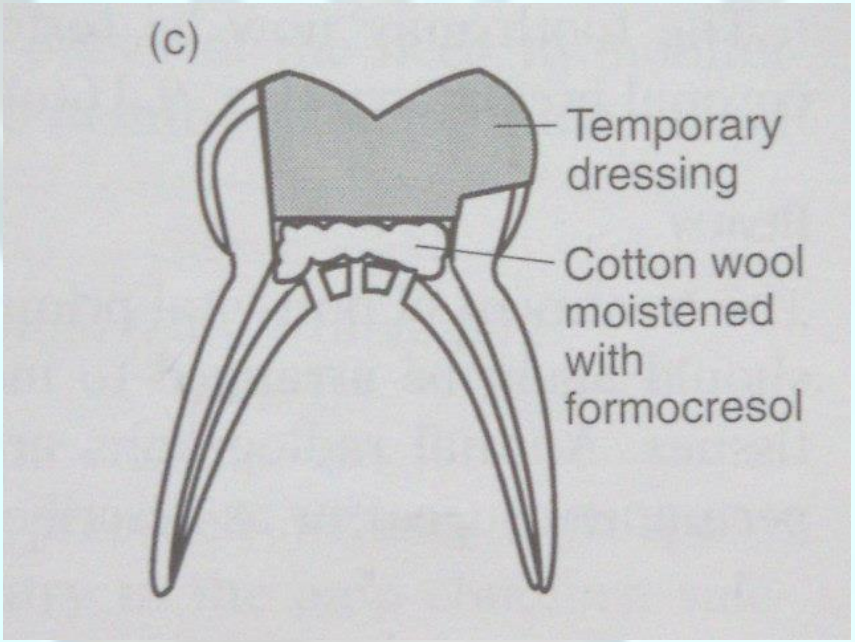






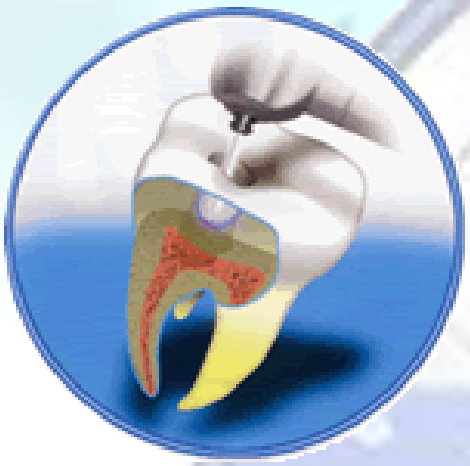


In multi-visit pulpectomy



Laser Pulpectomy

Safe and Cool cutting
With water energy



Access Preparations

Pulpectomy

Enlargements and Shaping

Obturation &
Restoration Placement

Benefits of Waterlase Pulpectomy

- Superior intra-operative and post-operative patient comfort
- Reduced post-operative complications such as inflammation, swelling and pain
- Versatile and effective for root canal preparation
- No vibration and pressure as found with conventional instruments
- More healthy tooth structure is preserved

Success criteria for pulpectomy

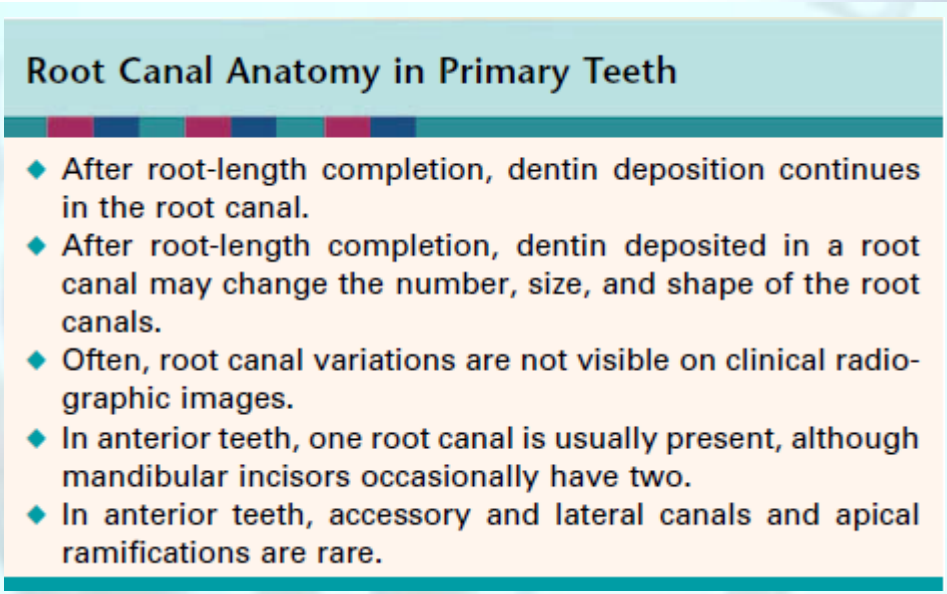
- Remains in function without pain or injection until the permanent successor is ready to erupt
- Undergoes physiologic resorption
- Free from fistulous tracts.
- Radiographically, success is judged by the absence of furcation or periradicular lesions and the re-establishment of a normal periodontal ligament.

Follow up – to be done once in 6 months

Postoperative signs that indicate failure

- pain
- parulis
- swelling of gingival margin
- pus from gingival sulcus
- patent fistula
- excessive mobility
- sensitivity to percussion
- development of radiolucency at the apex or furcation and
- premature root resorption.

Pulpectomy – a Controversy!



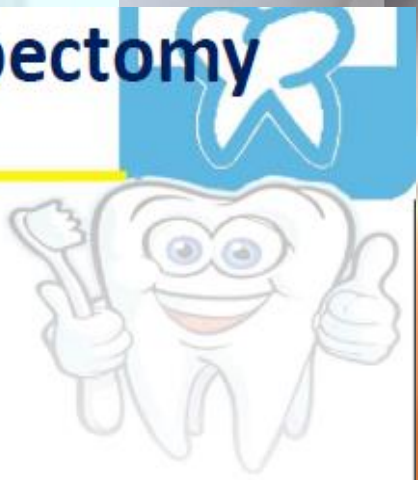
- Multiple ramifications and tortuous canals
- Proximity of apex to permanent tooth bud
- Physiological resorption – buccolingual direction
- Delayed eruption of permanent successor
- Possible deflection
- ankylosis of primary tooth

Starkey 1980

Limitations with pulpectomy for primary molars

- Accessory canals are present so complete pulp extirpation not possible
- Radicular pulp tissue is ribbon-like in shape so challenges with biomechanical preparation of the radicular pulp canal.
- Root is slender and flat mesio-distally increasing risk for root perforation during biomechanical preparation of radicular pulp canal.

Complications associated with pulpectomy



- Internal or external root resorption
- Delayed exfoliation of primary tooth
- Localised discolouration of succedaneous tooth in contact with root filling materials

Conclusion

Successful pulpal treatment of primary teeth depends upon proper case selection, good debridement and choice of root canal obturating material.

Rubberdam, Keeping the pulp chamber constantly flooded with as much irrigating solution ,stable reference points, optimal filling,Introducing temporary medication without affecting the interproximal papillae have to be taken care.

References

- Ingle 5th edition
- Fundamentals of pediatric dentistry – RJ.Mathewson
- Pathways of pulp – Cohen & Burn
- Kennedy's operative dentistry
- Endodontic practice – LI.Grossman
- Stewart scientific foundation
- Endodontics – Weine
- Mathewson
- Pinkham Nowak
- Pediat dent 2000,2001 & 2002,2014,2015,2016,2013
- DCNA 2000
- AAPD Guidelines for pulp therapy
- Endodontic journals,JISPPD,EJPD, J Dent for Child,JCPD

- Lele GS, Subba Reddy VV. Comparison of antibacterial efficacy of intracanal medicaments in multiple visit pulpectomies in primary molars-an in vivo study. J Indian Soc Pedod Prevent Dent, Jan - Mar 2010, Issue 1, Vol 28, 18-24.
- S.G.Damle and U. M. Nadkarni. Calcium Hydroxide And Zinc Oxide Eugenol As Root Canal Filling Materials In Primary Molars: A Comparative Study. Australian Endodontic Journal. Volume 31, No. 3 December 2005.
- Omar A. Bawazir, Fouad S. Salama. Clinical Evaluation of Root Canal Obturation Methods in Primary Teeth. Pediatric Dentistry – 28:1 2006, 39-47.
- Gupta S, Das G. Clinical and radiographic evaluation of zinc oxide eugenol and metapex in root canal treatment of primary teeth. Journal of Indian Society of Pedodontics and Preventive Dentistry, Jul - Sept 2011, Issue 3, Vol 29, 222-228.
- Ramar K, Mungara. Clinical and radiographic evaluation of pulpectomies using three root canal filling materials: An in-vivo study. J Indian Soc Pedod Prevent Dent, Jan - Mar 2010, Issue 1, Vol 28, 25-29.
- Trairatvorakul C, Chunlasikaiwan . Evidence-Based Review of Clinical Studies on Pulpectomy. JOE — Volume 35, Number 8, August 2009
- Moti Moskovitz, Dana Yahav, Nili Tickotsky & Gideon Holan. Long-term follow up of root canal treated primary molars. International Journal of Paediatric Dentistry 2010; 20: 207–213
- M. Hulsmann & W. Hahn. Complications during root canal irrigation – literature review and case reports. International Endodontic Journal, 33, 186–193, 2000.
- Neena IE, Ananthraj A, Praveen P, Karthik V, Rani P. Comparison of digital radiography and apex locator with the conventional method in root length determination of primary teeth. J Ind Soc Pedod Prev Dent Oct - Dec 2011;4(29): 300-304


Thank You