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DEVELOPMENTAL DEFECTS OF ENAMEL

PULP THERAPY IN PRIMARY TEETH

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Rationale for treatment

- Relief of pain
- Removal of infection
- To preserve the dentition.

Why preserve the primary dentition?

- Preservation of the arch
  - Space loss
  - Impact upon eruption
  - Midline shift
- Aesthetics
- Mastication – relevance?
- Speech development
- Psychological effects of missing teeth
- “Trauma” of extraction
- Save the tooth

Indications for endodontic treatment of the primary teeth

Pulpal pathology in children with

- Hypodontia
- Lack of a permanent successor
- A need for preservation of the dentition/arch
- Potential psychological problems with loss of a tooth
- Bleeding disorders and coagulopathy
  - Reduce the need for extraction

Contraindications for endodontic treatment of the primary teeth

- Acute odontogenic infection requiring drainage of pus
- Unrestorable tooth
- Extensive periapical/furcation pathology
- Excessive tooth mobility
- Near exfoliation
- Immunocompromised (including HIV, oncology)
- Cardiac defect – risk SBE
- Poor healing potential (including uncontrolled diabetes)
- Uncooperative or non-compliant patient

Diagnosis Of Conditions Requiring Pulp Therapy In Children

What we want to know:

- Are the signs and symptoms of an oral origin?
- Are they due to pulpal pathology?
- Is the pulp reversibly inflamed, irreversibly inflamed or necrotic.

Diagnosis – Examination

- Extra-oral
  - With respect to pulpal pathology, looking for:
    - Swelling
    - Erythema
    - Febrile
    - Lymphadenopathy

Diagnosis – Examination

- Intra-oral soft tissue
  - With respect to pulpal pathology, looking for
    - Fistula
    - Swelling
    - Erythema
    - Exudate from the gingival sulcus

Diagnosis – Examination

- Intra-oral hard tissue – Caries
  - With respect to pulpal pathology, looking for
    - Extent
    - Depth of lesions
    - Carious loss of the marginal ridge, particularly in a first primary molar, will inevitably involve the pulp.

Diagnosis – Examination

- Intra-oral hard tissue – Other pathology
  - With respect to pulpal pathology, looking for
    - Erosion
    - Attrition
    - Dens evaginitus
    - Dens invaginitus
    - Talon cusp

Diagnosis – Examination*

- Intra-oral hard tissue – TTP
  - With respect to pulpal pathology
    - Tenderness to percussion (TTP) is unreliable.
    - Often hard to assess TTP reliably due to the child's perception that any percussion on teeth is abnormal and therefore painful.

Diagnosis – Examination

- Intra-oral hard tissue – Mobility
  - With respect to pulpal pathology
    - Regard this as unreliable when assessing primary teeth.
    - Primary teeth with a healthy pulp may be somewhat mobile during phases of active physiologic root resorption.
    - Primary teeth with pulpal inflammation may have very little mobility.

Diagnosis – Examination

- Intra-oral hard tissue – Pulp sensibility tests (including CO2, ethyl chloride, hot GP, electric)
  - Regard these as unreliable in young children.
  - Apprehension, fear or management difficulties often mean that the response is mixed.
  - Many children with healthy pulps do not respond to sensibility testing.

Diagnosis – Examination

- Periodontium
  - With respect to pulpal pathology, looking for
    - Clinical attachment loss
    - Absence of food packs – can mimic pain similar to irreversible pulpitis (Fuks 2000).
    - Erupting teeth – can mimic pain similar to that of pulpal origin.

Diagnosis – Examination

- Radiographic examination
  - Bitewings and periapical
  - Beware being "misled" by normal features which may be wrongly interpreted as apical pathosis:
    - physiological root resorption
    - expanded dental follicles
  - Furcation radiolucency

Classification of endodontic treatment for primary teeth

Vital therapy

- Indirect pulp cap
- Direct pulp cap
- Pulpotomy

Non-vital therapy

- Pulpectomy

Treatment

- Foregone conclusions when providing endodontic treatment for children
  - Effective anaesthesia
  - Rubber dam isolation
  - Adequate current radiographs

Indirect Pulp Cap – Primary Teeth

- Technique for avoiding pulp exposure when treating teeth with deep carious lesions in which there is no clinical evidence of pulpal degeneration or periapical disease.

Indirect Pulp Cap – Primary Teeth

As a general rule; not encouraged.

Be definitive about your treatment.

Direct Pulp Cap – Primary Teeth

- Application of a medicament to the exposed pulp in an attempt to preserve its vitality.

- The aim of pulp capping is to ensure decontamination of the superficial pulp layer, and encourage formation of a dentine bridge over the exposed area.

Direct Pulp Cap – Primary Teeth

- Direct pulp capping is generally contraindicated in primary teeth due to persistence of pulpal inflammation and subsequent total pulp necrosis or internal resorption.

Direct Pulp Cap – Primary Teeth

- The only exception when it may be acceptable to do a DPC in a primary tooth may be in the case of an extremely small mechanical or traumatic exposure.

Pulpotomy – Primary Teeth

Amputation of the infected coronal portion of the pulp, preserving the vitality and function of the remaining radicular pulp (AAPD Definition).

Pulpotomy – Primary Teeth

- The specific criteria are:
  - No history of spontaneous tooth ache
  - No evidence of periapical or furcation pathology
  - No fistula/draining sinus
  - Pulp must be vital – ie it must bleed when it is entered. If it doesn't bleed, it means it is dead.
  - Should be able to control haemorrhage after amputation of the coronal pulp.

Essentially, the pulp must not be necrotic nor can it be irreversibly inflamed.

Pulpotomy – Primary Teeth

The procedure for a pulpotomy is:

1. Accurate diagnosis
2. Preoperative radiograph
3. Local anaesthesia
4. Rubber dam
5. Removal of caries
6. Endodontic access using a high speed bur and copious sterile irrigant
7. Removal of the entire coronal pulp using a brand new, slow speed, number 6 or 8 round bur

Pulpotomy – Primary Teeth

Procedure for a pulpotomy (continued):

8. Irrigate the chamber to remove all debris
9. Attempt to achieve haemostasis by applying pressure to the radicular pulp stumps; use a sterile cotton pellet which has been slightly moistened with sterile saline; pack dry cotton pellets over the top of this pellet.
10. Wait for five minutes

Pulpotomy – Primary Teeth

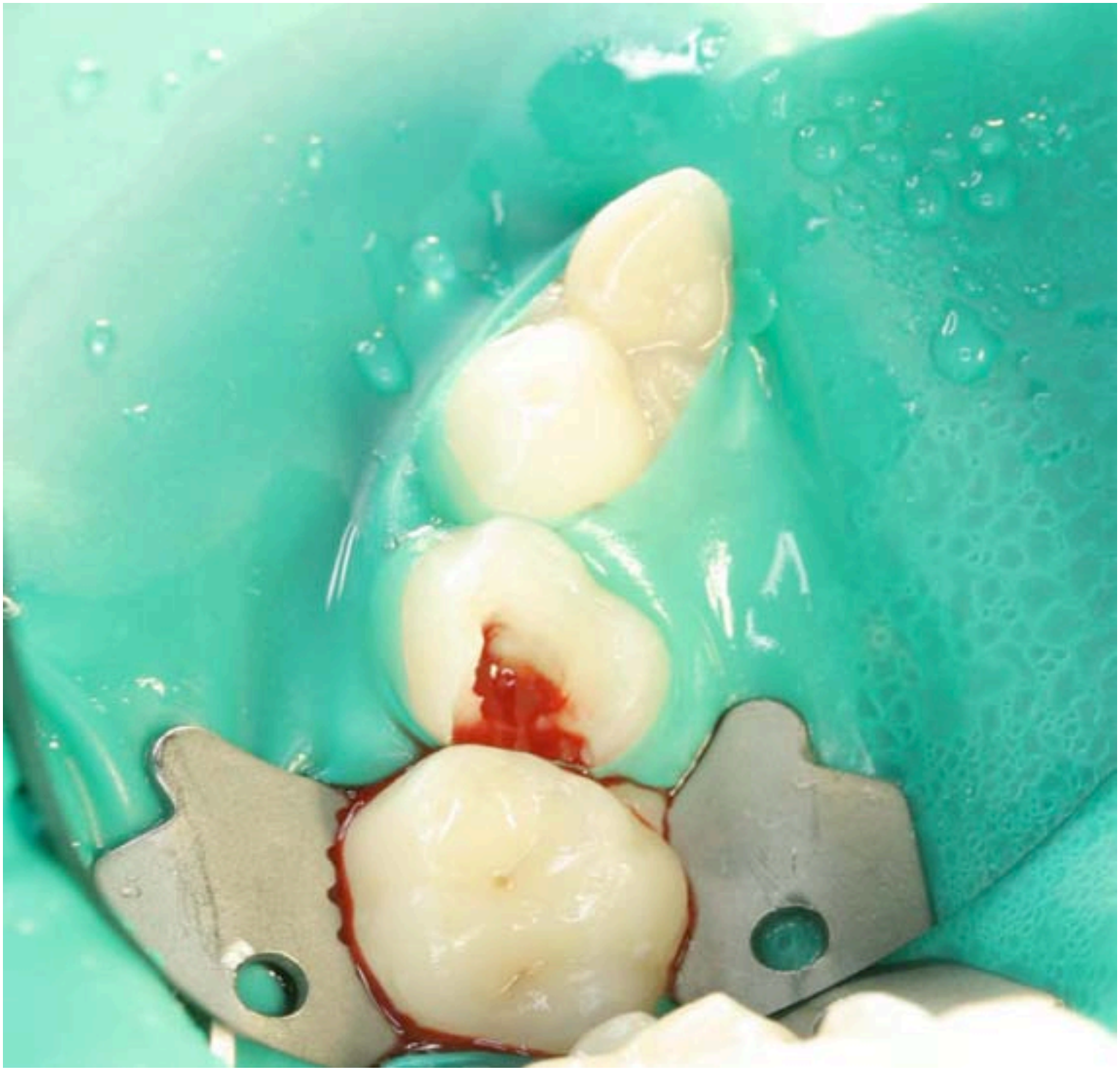
Procedure for a pulpotomy (continued):

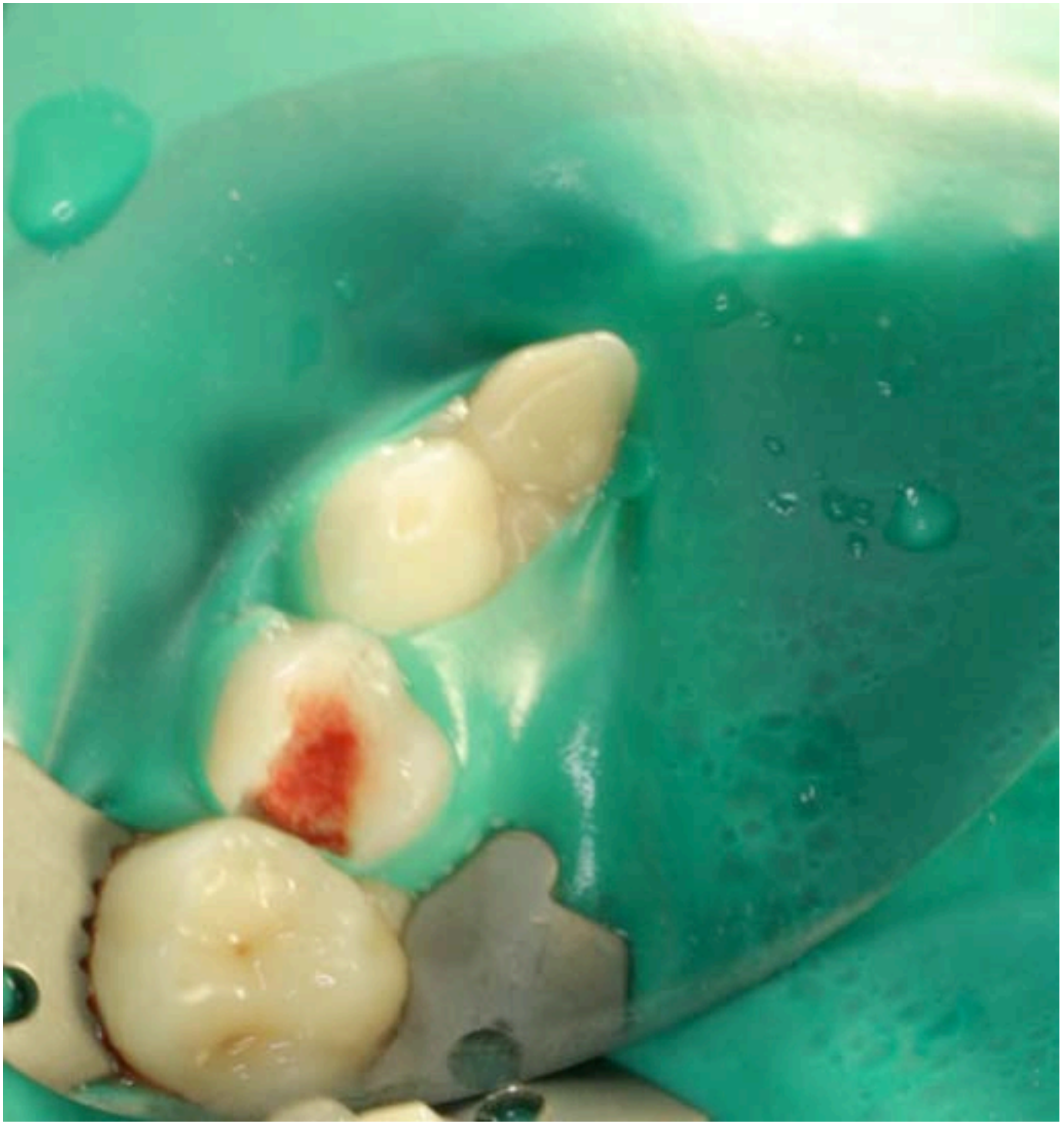
11. If bleeding has ceased, you may proceed with the pulpotomy. If it has not ceased, ensure all of the coronal pulp has been removed and reapply pressure for another five minutes. If haemostasis is not achieved after this, it may be a sign of an irreversibly inflamed pulp – pulpotomy may not be suitable.

Pulpotomy – Primary Teeth

Procedure for a pulpotomy (continued):

12. Assuming there is haemostasis, apply the pulpal medicament (discussed later)
13. Restore the tooth:
    1. ZOE, then
    2. GIC core build-up, then
    3. SSC or CR strip crown.
14. Review clinically in 1-2 weeks then every six months.





Pulpotomy – Primary Teeth

Pulpal medicaments

- There exist various pulpal medicaments or other procedures that attempt to achieve mummification (sterile necrosis) of the surface of the radicular pulp and preserve the remainder of the radicular pulp. these include:
  - Formocresol
  - MTA
  - Ferric sulphate
  - Calcium hydroxide
  - Electrosurgery
  - Laser

Pulpotomy – Primary Teeth

Pulpal medicaments – Formocresol

- This is the most commonly used pulpotomy medicament.
- Not necessarily the most ideal due to the fact that it is a toxic agent.
- Very effective.

Pulpotomy – Primary Teeth

The reality of formocresol pulpotomies in primary teeth

- In reality, formocresol pulpotomies don't preserve the vitality of the pulp indefinitely; rather, they remove infection, mummify the surface of the radicular pulp and create a very slowly progressing chronic inflammatory response in the remaining radicular pulp. Ultimately this chronic inflammation leads to pulp necrosis. But don't despair! Pulpotomies still work – they eliminate bacterial infection and delay necrosis of the pulp so much that it buys us time. As a general rule, it buys us so much time that the primary tooth has usually exfoliated before there are any sequelae associated with the chronic inflammation or gradual pulp necrosis.

Pulpotomy – Primary Teeth

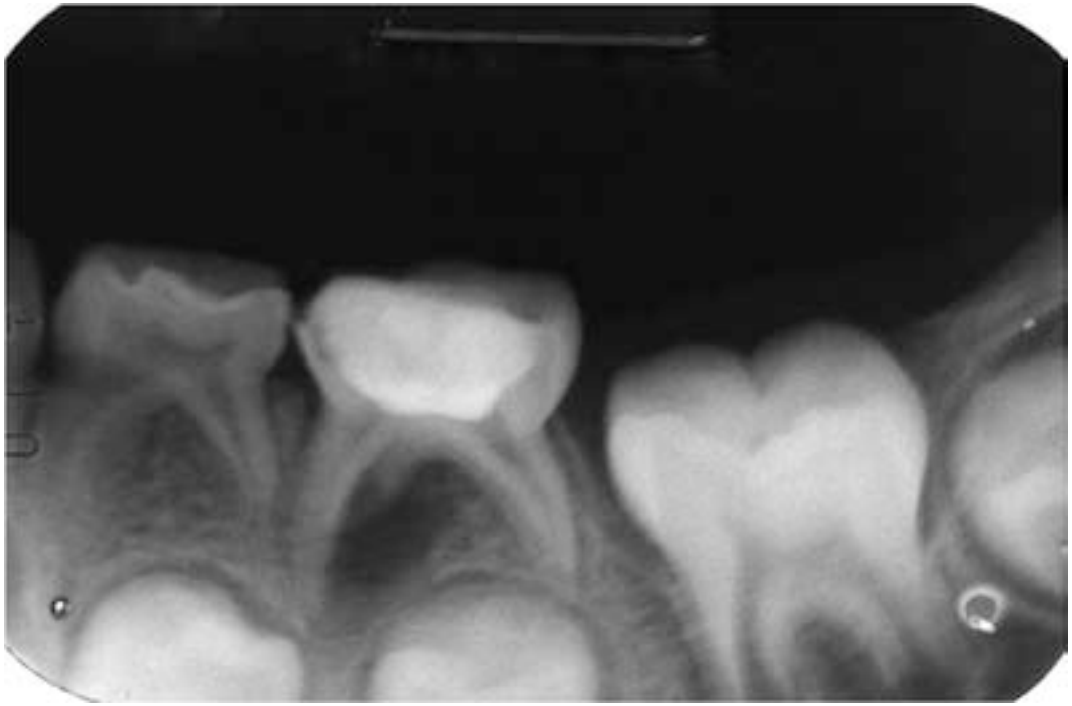
Pulpal medicaments – others:

- **Ferric sulphate** is being touted as the replacement for formocresol. More work is required to prove its efficacy.

- **Electrosurgery** and **laser** pulpotomies have not been used long enough to prove their suitability. Results vary.

- **Calcium hydroxide** pulpotomies in primary teeth have a success that is much less than formocresol pulpotomies.

- **MTA** is an emerging material that may have a role in pulpotomies. Further investigations are necessary.

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Extraction – Primary Tooth

- Not really a pulp therapy, but it is a common reality for primary teeth that are pulpally involved.

- Must consider the ramifications of extracting primary teeth.

Prognosis and Success

Success is determined by:

- Absence of adverse clinical signs or symptoms such as prolonged sensitivity, pain or swelling;
- No radiographic evidence of resorption;
- No breakdown of peri-radicular tissue;
- No harm to succedaneous teeth.

Prognosis and Success

Primary teeth procedures (assuming strict selection criteria and procedure done correctly)

- Indirect pulp capping – 74%-95%.
- Direct pulp capping – 80-90%.
- Pulpotomy – 92-98%.
- Pulpectomy – 75-96%

Survival Guide

- Medically compromised children – reconsider the safety of any pulp therapy
- Pulp therapy takes time – make sure the child can last the distance
- Remember the selection criteria for each procedure
- Seal of endodontically treated tooth determines its fate – SSC or CR crown
- Spontaneous pain means you cannot do a pulpotomy

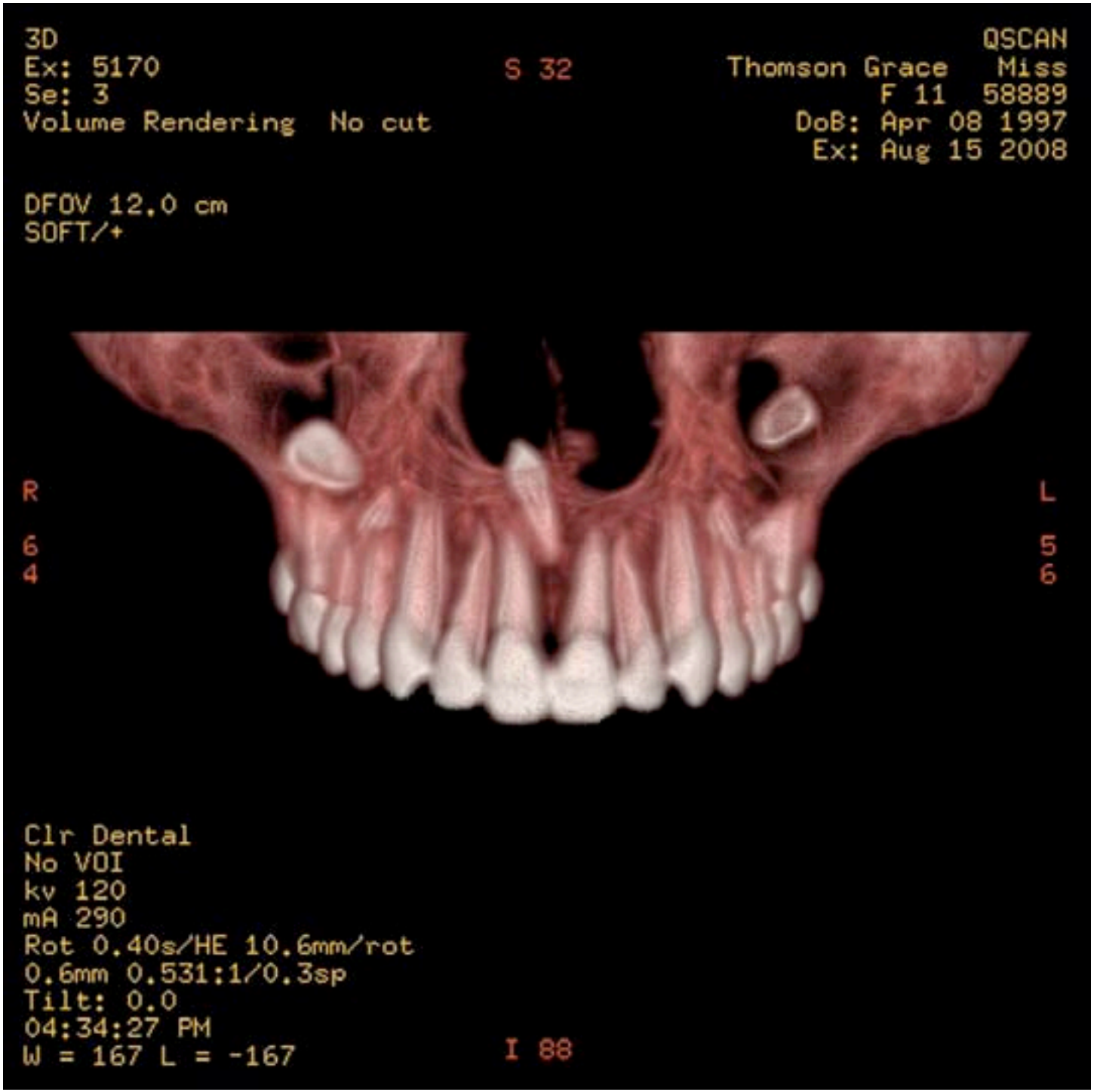
Survival Guide

- Multiple abscessed teeth or history of successive abscesses – refer. High possibility of underlying metabolic or developmental disorder such as Vitamin D resistant rickets or dentinogenesis imperfecta.

- Be aware of clinical and radiographic presentations which mimic pulpal pain.

- Extraction is not the easy way out – it requires consideration of a lot of factors and then requires good management and technique to perform the procedure

- If in doubt –refer.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Paediatric Dental Group – What is Paediatric Dentistry?

http://www.pdgdental.com.au/what-is-paediatric-dentistry.html

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What is Paediatric Dentistry?

Paediatric Dentistry is a specialist field of dentistry for infants, children and adolescents. The specialty training involves many years of post-graduate study and working in various hospitals and clinics dedicated to caring for children. Children are referred to our specialist practice for many reasons, including:

- A need for complex dental treatment
- Dental treatment for children with medical conditions
- Diagnosis and management of the oral aspects of genetic conditions
- Diagnosis and management of the oral aspects of craniofacial syndromes
- Management of oral and dental trauma
- Paediatric oral surgery, including extractions and management of unerupted teeth, impacted teeth, supernumerary (extra) teeth, and soft tissue surgery
- Management of developmental conditions, including enamel hypoplasia and dentine defects, missing teeth, extra teeth and abnormal eruption of teeth
- Interceptive orthodontics
- Endodontic treatment of the baby and adult teeth
- Anxiety in the dental setting
- Behaviour management in the dental setting
- Treatment under sedation or general anaesthesia when indicated.

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Plan

- Epidemiology
- Aetiology
- Diagnosis
- Clinical implications
- Management

Definitions

- Developmental defects of enamel (DDE):

  anomalies of tooth enamel that occur due to enamel organ dysfunction

Enamel Hypoplasia

- Quantitative defect
- Reduced thickness or complete absence of enamel
- With or without opacity
- Pits, grooves or missing enamel
- Variable degrees of porosity

Enamel Hypomineralisation

- Qualitative defect of enamel mineralisation
- Altered translucency
- Opacities: demarcated or diffuse
- Discolouration: white, cream, yellow or brown
- Variable degrees of porosity

Epidemiology – Prevalence Brisbane

- Primary dentition
  - 25% - any defect
  - 15% - enamel opacities
  - 10% - enamel hypoplasia

- Permanent dentition:
  - 59% - any defect
  - 41% - enamel opacities
  - 18% - enamel hypoplasia.

Mean number of teeth affected

- Primary dentition
  - 4 teeth affected

- Permanent dentition
  - 5 teeth affected

Aetiology

- Inherited
- Acquired

Aetiology – Inherited

- Amelogenesis imperfecta

- Inherited systemic conditions with enamel defects

Aetiology – Inherited

- Enamel defects related to ectodermal dysplasia and ectodermal -mesodermal disorders

Aetiology – Inherited

- Enamel defects associated with multiple systemic malformation / dysmorphic syndromes

Aetiology – Inherited

- Enamel defects associated with inherited disorders of calcium metabolism

Aetiology – Acquired

- Infection
- Metabolic conditions
- Chemical/drug
- Trauma
- Unknown

Aetiology – Acquired
Medical factors

- Significant association between DDE and:
  - Exposure to cigarette smoke
  - Respiratory infections
  - Asthma
  - Otitis media
  - Chickenpox
  - Urinary tract infections (UTI)

Aetiology – Acquired Medical factors

- Exposure to cigarette smoke
  - Passive exposure
  - During the pre-natal or early childhood periods
  - Greatest percentage of children with enamel defects

Aetiology – Acquired Medical factors

- Exposure to cigarette smoke
  - Mechanism of action: direct or indirect
  - Indirect:
    - Parental smoking during pregnancy and childhood leads to adverse health effects for children
    - These effects may indirectly contribute to DDE
  - Direct:
    - ? evidence
    - ? cytotoxic or inhibitory effect on ameloblast

Aetiology – Acquired Medical factors

- Asthma
  - Relative hypoxia
  - Concurrent respiratory infection with asthma
  - Other underlying condition

  - Suckling (1987) Vs Current findings

Aetiology – Acquired Medical factors

- Otitis media, Chickenpox, UTI
  - ? mechanism of action
  - Possible direct and indirect effects including infection of the ameloblast or the effect of pyrexia on the ameloblast.

Aetiology – Acquired
Fluoride factors

- Excessive levels of fluoride cause DDE
- Role of child's F tooth paste
  - No association with DDE
- Role of adult's F tooth paste (0-6 yoa)
  - Strong association with hypomineralisation

Ford, Seow *et al.*
(2007)

Aetiology – Acquired
Fluoride factors

- Role of fluoridated water
- Strong association between no DDE and fluoridated water 0-6 yoa
- ? Protective
- Systemic Vs Topical

Ford, Seow *et al.* (in press)

Clinical Implications of DDE

- Relationship between DDE and caries
  - Strong association
  - 2-4 times greater prevalence of caries
  - Due to plaque and substrate retention, porosity, exposed dentine
  - Mild diffuse opacities have reduced caries risk

Clinical Implications of DDE

- Relationship between DDE and erosion
  - Significant relationship between DDE and dental erosion
  - Reduced enamel thickness and enamel integrity makes the tooth more prone to the effects of acids

Clinical Implications of DDE

- Aesthetics
  - Discolouration
  - Surface roughness
  - Staining
  - Abnormal crown shapes
  - Loss of OVD

Clinical Implications of DDE

- Sensitivity/Pain
  - Significant problem
  - Due to exposure of dentine
  - But also with intact enamel
  - Difficulty achieving anaesthesia
  - Reason unknown

Clinical Implications of DDE

- Vertical dimension
  - AOB
    - Variants of AI
    - ? aetiology
  - Reduced occlusal vertical dimension
    - Due to attrition and post -eruptive enamel loss

Clinical Implications of DDE

- Periodontium
  - Poor gingival health
  - Due to accumulation and retention of plaque
  - Iatrogenic

Management of DDE

- Do something

Management of DDE

- Preventive
  - OH
  - Fluoride varnish
  - Fluoride other
  - Chlorhexidine
  - Fissure sealants

Management of DDE

- Restorative (+/- Endo)
  - Intra-coronal
    - Amalgam
    - CR
    - GIC

Management of DDE

- Restorative (+/- Endo)
  - Extra-coronal
    - CR Crown
    - SSC
    - Metal onlay
    - Fixed crown – porcelain, gold

Management of DDE

- Extraction (+/- Orthodontics) – only after careful specialist assessment

Management of DDE

- Extraction (with or without ortho)

Management of DDE

- Aesthetics
  - Restorative
  - Micro-abrasion
  - Bleaching

Summary

- DDE is a major feature of clinical paediatric dentistry
- High prevalence of DDE
- Determination of aetiology is often difficult, and sometimes not possible

Summary

- Aetiology:
  - Association between DDE and medical factors such as exposure to cigarette smoke, UTI, asthma, chickenpox, respiratory conditions and otitis media
  - Association between hypomineralisation and use of an adult-type toothpaste prior to six yoa
  - Possible that fluoridated water may offer some protection against DDE.

Summary

- Management of DDE demands in-depth treatment planning and complex treatment


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The Paediatric Dental Group (PDG) is a specialist practice dedicated to the oral health of infants, children and adolescents. We provide comprehensive care in all aspects of paediatric dentistry, including management of very severe or complex dental conditions, dental treatment for children with medical conditions, emergency and ongoing care following trauma and infection, oral surgery, interceptive orthodontics, and care for anxious children. We also welcome those children who have no specific dental concerns, but want access to specialist care to build the foundations for great oral health for life.
Our focus is on specialist treatment for your children in a caring environment. We are dedicated to first class health care and promotion of good health in the future.
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