DEVELOPMENTAL DISTURBANCES OF TEETH

DR. RAJASHEKHARA B.S.
**OUTLINE**

- **Disturbance in Number of Teeth**
  - Hyper / Hypodontia
  - Oligo / Anodontia

- **Disturbance in Size of Teeth**
  - Micro/ Macrodontia

- **Disturbance in Shape of Teeth**
  - Double Teeth
  - Concrescence
  - Dens Evaginatus
  - Dens Invaginatus
  - Taurodontism
  - Dilaceration
Disturbances in Structure of Enamel
Amelogenesis imperfecta
Non inherited disorders

Disturbances in Structure of Dentin
Dentinogenesis Imperfecta
Dentin Dysplasia

Regional Odontodysplasia
Anomalies at different stages of tooth development

Dental lamina formation stage
  Anodontia

Initiation and proliferation
  Oligodontia
  Supernumerary teeth
  Geminated / fused teeth

Histodifferentiation (defects in multiple dental tissues)
  Regional odontodysplasia
Morphodifferentiation (defects in size & shape)

- Macrodontia / Microdontia
- Dens invaginatus / Dens evaginatus
- Hutchinson’s incisors, mulberry molars
- Talon cusp
- Taurodontism

Apposition (defects in structure of enamel & dentin)

- Amelogenesis imperfecta
- Enamel Hypoplasia
- Dentinogenesis imperfecta
- Dentin dysplasia
Disturbance In Size Of Teeth

Basic Principles

Butler’s Field Theory (1953): most distal members of a class are more asymmetrical than mesial members.

Maxilla

CI   LI   canine   I PM II PM   I   II   III molar

Mandible

CI   LI   canine   I   PM II PM   I II III molar

Int j pediat dent 2004; vol 14; no 6; 446 - 450
Microdontia

- Relative Microdontia
- Diffuse / Generalized Microdontia
- Regional / Localized Microdontia

**Frequently Affected Teeth**: max lateral incisors & 3rd molars

**Treatment**
- Composite / Porcelain Veneers
Macrodontia

**Synonyms**: Megadontia, Megalodontia

- Diffuse / Generalized Macrodontia
- Regional / Localized Macrodontia
- Rhizomegaly / Radiculomegaly
  (Extremely long root anomaly)

Rare condition: RHIZOMICRY
root dwarfism / short root anomaly

(RJ of oral surg oral med oral path- 1996)
Treatment

- Stripping to reduce tooth size
- Can be combined with build – up of antimere if only one tooth is affected
- Extraction & replacement by prosthesis

Differential diagnosis

Fusion / Gemination

Diffuse macrodontia: pituitary gigantism and pineal hypoplasia with hyperinsulinism.
Disturbances in number of teeth

- Anodontia: total lack of tooth development
  - Total Anodontia
  - Partial Anodontia
- Oligodontia: (lack of development of 1 or more teeth)
- Hypodontia: (lack of development of 6 or more teeth)
Hypodontia ---

C/F

- F:M – 1.5:1
- 3rd molars > max lat inci > 2nd premolar
- Assoc - Microdontia, ↓ alveolar height, retained primary teeth

Over 50 syndromes associated

- Clefting
- Down ‘s syndrome
- Ectodermal dysplasia
- Chondro – ectodermal dysplasia
Treatment

- Acid-etch retained composite buildup’s of conical
- Partial dentures: conventional / overdentures
- Orthodontic management of spaces
- Osseo - integrated implants (after cessation of growth)
Solitary median maxillary central incisor syndrome (SMMCI)

- Midline maxillary central incisor
- Caused by events occurring from 35th-38th day in utero
- Fusion of right & left dental lamina prematurely
- Associated with other midline defects – cleft palate, atresia, umbilical hernia
- Pituitary dysfunction, GH↓, short stature

Int J pediat dent; no 6; mar; 2008

-- Hall et al
Hyperdontia / supernumerary teeth

Modified Howard’s classification

Based on morphology

Accessory

Conical

Composite

Odontoma

Tuberculate

supplemental
Thoeries for supernumerary teeth

1) **DICHOTOMY thoery**:
   - tooth bud splits – 2 equal or different sized parts – one Eumorphic & other Dysmorphic tooth
   - -- Taylor (1972)

2) Localized & independent hyperactivity of dental lamina:
   - conditioned hyperactivity

J indian soc pedo prev dent ;mar 2005
Clinical problems of supernumerary teeth

- Failure of eruption – tuberculate type
- Displacement / rotation
- Crowding
- Abnormal diastema / premature space closure
- Dilaceration / abnormal root development
- Cystic formation
- Eruption into nasal cavity
Treatment

- Conical often erupt & easily extracted

- Tuberculate &/ inverted conical teeth require surgical removal to allow uninhibited eruption of permanent teeth

- Vertex occlusal radiographs gives clearer view / tube – shift technique

- Before 10 yrs :
  If unerupted central incisor is correctly aligned – surgical removal of supernumerary tooth

- After 10 yrs :
  If central incisor malaligned – surgical exposure with/without bonding of brackets or chains & subsequent Orthodontic traction may be required
Disturbance In Shape Of Teeth
Double Teeth

Synonyms: DoubleFormations, Joined Teeth, Bifid Teeth, Connation

Classification:
- Fusion (syndopdontia)
- Gemination
- Schizodontia

Clinical importance:
- Crowding / spacing
- Periodontal problem
- Caries
- Eruption disturbance
- Aesthetics
Gemination

Single enlarged tooth or joined tooth
Tooth count is normal

Fusion

Single enlarged tooth or joined tooth
Tooth count reveals – a missing tooth

Causes:

Physical force or pressure
Before calcification begins - single larger tooth.
C/F : Gemination & Fusion

- Affects both primary & permanent dentition
- High frequency: maxillary & anterior region

Treatment

- Central groove on labial & palatal surfaces: extremely prone to caries --- early "fissure sealing"
- In permanent dentition: surgical separation --- subsequent orthodontic alignment / restorative treatment to reshape the crown
Concrescence

**Etiology**
- Developmental
- Post inflammatory: carious molars

**Clinical features**
- Teeth united by cementum
- Commonly affected maxillary molars
- Primary teeth least affected
Pathogenesis

Traumatic injury
Crowding of teeth ---
interdental bone resorption

Treatment
No therapy

Clinical importance
Extraction difficulty
Dens Invaginatus

**Synonyms** : Dens in dente / Dilated Odontome / Tooth Inclusion / radix in radice

**Definition** : is a deep surface invagination of the crown / root that is lined by enamel

**Clinical significance**
- Predisposition to caries
- Pulpal pathology
- Periapical pathology (Type III)
- Early diagnosis – mandatory
Classification

[ Oehler’s in 1957 ]

Coronal

- Deep
- Superficial

Radicular

- Furrowing of roots
- Barrel-shaped roots

Coronal dens invaginatus

Type I
Type II
Type III

Radiccular - rare
Treatment

Vital teeth - Preventive & restorative treatment
  Fissure sealing
  Composite restoration & periodic review

Nonvital teeth – Apexification followed by endodontic treatment

Endodontic treatment
  Cleaning & shaping – irrigation with ultrasonic cleaning
  Obturation – thermoplastic technique
  Type III – treat separately
DENS EVAGINATUS

**Synonyms**: occlusal tubercle, Leong’s PM, dilated composite odontoma, tuberculated PM, occlusal enamel pearl, evaginated odontoma

**Occurs**: central groove or lingual ridge of the buccal cusp of permanent PM or molar teeth
Pathogenesis:
- Proliferation & Evagination of IEE (Tartman)
- Hereditary – Autosomal dominant

Clinical significance:
- Fracture / Wear: Pulpal pathosis
- Eruption interference
Clinical Features

- Bilateral occurrence
- Assoc. - Shovel shaped incisor
- Common in mandible

Treatment

Vital teeth
- Selective grinding followed by fissure sealing

Selective pulpotomy to allow normal formation: if diagnosed early

Nonvital teeth
- Apexification followed by endodontic treatment

Hill & Bellis (1984)
Talon Cusp

**Definition:**

an additional cusp that projects from the lingual surface of primary or permanent anterior teeth, is morphologically well delineated & extends at least half the distance from the cement–enamel junction to the incisal edge

**Pathogenesis:**

Proliferation & evagination of IEE

*Davis & Brook*
3 PATTERNS OF TALON CUSPS

Trace talon
Semi-talon
Talon

Forms: T-form; Y-shaped

Syndromes
Rubinstein – Taybi,
Struge – Weber
Orofacial digital syndrome
Treatment

Fissure sealants to prevent caries around the margins

If interfering with occlusion:
small progressive reduction of enamel to avoid pulp exposure, or elective pulpotomy
Taurodontism

1913, Keith Tauro - Bull, dont – tooth

Pathogenesis
Failure of HERS to invaginate at the proper horizontal level

Clinical Features
Unilateral / Bilateral
Permanent > primary teeth
3rd > 2nd > 1st molar (field effect)
Shaw’s classification (1928)

Basis of apical placement of pulp chamber

- Mild hypotaurodont
- Moderate mesotaurodont
- Severe hypertaurodont
Radiographic Features

- Rectangular in shape
- Pulp chamber: large
- Lacks constriction
- Roots exceedingly short
- Bifurcation or trifurcation - few mm

Clinical significance

Endodontic therapy – challenging task

Furcation involvement
Stability & strength as abutment
**Diagnosis**
Made only radiographically

**Treatment**
No specific therapy

**Pulp therapy in taurodonts:**
Challenging task
↑ bleeding during access
Canal locating, instrumenting, obturating difficult

*Fig. 44-7. Normal tooth (A) compared to taurodontism (B). Note increased pulp width in B.*
Dilaceration

“kinked tooth” or “sickle-tooth”

Abnormal angulation / bend in the root or less frequently the crown of a tooth

Consequence of a laceration / tear of tooth germ / injury before 4 yrs of age that displaces calcified tooth portion

Permanent maxillary incisors frequently involved
Three main etiologic theories
For Dilaceration

- **Acute trauma**
  Before 4-5 yrs of age

- **Scar formation**
  Trauma to primary tooth causes a wound
  - scar prevents normal eruption, root adheres to scar & rotate around this fixed point

- **Primary tooth germ developmental anomaly**
Treatment

Deciduous teeth – Extraction

Permanent teeth

Minor – no treatment
Delayed / abnormal eruption – surgical exposure / orthodontic intervention
Nonvital teeth – Endodontic treatment
Extensive --- Extraction
Developmental Alteration In The Structure Of Teeth

Hereditary type
- Amelogenesis Imperfecta
- Inherited systemic conditions with enamel defects

Acquired Enamel Defect
- Non-inherited enamel defects
Non-inherited Enamel Structural Defects

Systemic factors associated with Enamel Hypoplasia

**Birth trauma**
- Multiple births
- Prolonged labor

**Infections**
- Syphilis
- Rubella
- Cytomegalovirus
- Measles
- Chicken pox
- Pneumonia

**Chemicals**
- Tetracycline
- Lead
- Fluoride

**Nutritional disorders**
- Vit D & A deficiency

**Metabolic diseases**
- Maternal diabetes
- Hyperbilirubinemia
- Neonatal asphyxia
- Hypocalcemia / Hypothyroidism
- Cardiac disease
- GI malabsorption
- Nephrotic syndrome, chronic renal failure
- Premature birth
Birth prematurity & low birth weight

- Deficiency of Ca $^{2+}$ & Po$_{4}^{-}$
- Trauma to alveolar ridge
- Hyperbilirubinaemia – intrinsic staining
- Intubation trauma -- enamel hypoplasia / hypocalcification
- Commonly affected – max left central incisor
- Tooth eruption may delay
- Chronological opacities / hypoplasia
Turner’s Hypoplasia

Local factors
  Trauma
  Infection
Chronologic Enamel Hypoplasia

Severe systemic event during development of teeth
(3 mon in utero – 20 yrs)

- Mostly subclinical,
- Only in hard tissues as changes in incremental deposition lines
  - discoloration
  - opacitization
  - hypoplasia

Clinical Significance
- Esthetics
- Dental caries
- Tooth sensitivity
- Loss of vertical dimension

Treatment
- Microabrasion ---- 18% HCL / 37% phosphoric acid
- Veneers
**Fluorosis**

**Pathogenesis**

- **Presecretory stage** – no effect at physiologically relevant F1 dose

- **Secretory stage** – inhibit protein synthesis at high dose

- **Maturation stage** – delayed withdrawal of amelogenin, serine proteinases activity
  -- Enamel matrix protein tightly bound to fluorapatite
Tetracycline

Mechanism

Toxic to ameloblasts
Disruption of mineralization
Chelating Ca$^{2+}$ of hydroxyapatite

Critical period

<table>
<thead>
<tr>
<th>Teeth</th>
<th>IU (months)</th>
<th>EU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prim incisors</td>
<td>4</td>
<td>3 months</td>
</tr>
<tr>
<td>Prim canines</td>
<td>5</td>
<td>9 months</td>
</tr>
<tr>
<td>Perm incisors &amp; canines</td>
<td>3-5</td>
<td>7 years</td>
</tr>
</tbody>
</table>
Mottled enamel

**Fluorosis**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Clinical appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very mild</td>
<td>White opaque, &lt; 25%</td>
</tr>
<tr>
<td>Mild</td>
<td>-;--;-  &lt;= 50%</td>
</tr>
<tr>
<td>Moderate</td>
<td>-;--;-/ brownish</td>
</tr>
<tr>
<td>Severe</td>
<td>Opaque, pitted, brown, brittle</td>
</tr>
</tbody>
</table>

Endemic (>2ppm)
Permanent teeth > Deciduous
tooth
Less susceptible to caries
Amelogenesis Imperfecta
Development of normal enamel occurs in 3 stages:

- Formative
- Calcification
- Maturative

Three Basic Types Of Amelogenesis Imperfecta

- Hypoplastic pitted
- Hypocalcified
- Hypomaturation
<table>
<thead>
<tr>
<th>Type</th>
<th>Pattern</th>
<th>Features</th>
<th>Inheritance</th>
</tr>
</thead>
<tbody>
<tr>
<td>I A</td>
<td>HYPOPLASTIC</td>
<td>Generalized pitted</td>
<td>AD</td>
</tr>
<tr>
<td>IB</td>
<td>--</td>
<td>Localized pitted</td>
<td>--</td>
</tr>
<tr>
<td>IC</td>
<td>--</td>
<td>--</td>
<td>AR</td>
</tr>
<tr>
<td>ID</td>
<td>--</td>
<td>Diffuse smooth</td>
<td>AD</td>
</tr>
<tr>
<td>IE</td>
<td>--</td>
<td>--</td>
<td>X</td>
</tr>
<tr>
<td>IF</td>
<td>--</td>
<td>Diffuse rough</td>
<td>AD</td>
</tr>
<tr>
<td>IG</td>
<td>--</td>
<td>Enamel agenesis</td>
<td>AR</td>
</tr>
<tr>
<td>IIA</td>
<td>HYPOMATURATION</td>
<td>Diffuse pigmented</td>
<td>AR</td>
</tr>
<tr>
<td>IIB</td>
<td>--</td>
<td>Diffuse</td>
<td>X</td>
</tr>
<tr>
<td>IIC</td>
<td>--</td>
<td>Snow capped</td>
<td>X</td>
</tr>
<tr>
<td>IID</td>
<td>--</td>
<td>--</td>
<td>AD</td>
</tr>
<tr>
<td>IIIA</td>
<td>HYPOCALCIFIED</td>
<td>Diffuse</td>
<td>--</td>
</tr>
<tr>
<td>IIIB</td>
<td>--</td>
<td>--</td>
<td>AR</td>
</tr>
<tr>
<td>IV A</td>
<td>HYPOMATURATION-HYPOPLASTIC</td>
<td>Associated taurodontism</td>
<td>AD</td>
</tr>
<tr>
<td>IVB</td>
<td>HYPOPLASTIC-HYPOMATURATION</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Clinical significance

- Aesthetics
- Vertical dimension
- Caries

Treatment

- Appropriate diagnosis
- Genetic counseling & continued commitment to support both parent & child
- Early orthodontic assessment
- Preservation of VD by full coverage stainless steel crowns
- Aesthetics by composite resin veneers for anterior
Dentinogenesis Imperfecta

Synonyms: Hereditary opalescent dentin

Definition: Hereditary developmental disturbance of the dentin in the absence of any systemic disorder

Classification:

<table>
<thead>
<tr>
<th>Shields</th>
<th>Clinical presentation</th>
<th>Witkop</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI - I</td>
<td>Osteogenesis Imperfecta + Opalescent teeth</td>
<td>DI</td>
</tr>
<tr>
<td>DI- II</td>
<td>Isolated opalescent teeth</td>
<td>Hereditary opalescent teeth</td>
</tr>
<tr>
<td>DI - III</td>
<td>Isolated opalescent teeth</td>
<td>Brandywine isolate</td>
</tr>
</tbody>
</table>
Clinical Features

`Tulip – shape`
Gray to
Blue – brown in
colour

Radiographic Features

Dentinogenesis Imperfecta – I, II

Dentinogenesis Imperfecta – III
(Shell Teeth)
Clinical Features

Deciduous $>$ permanent
1st molar & incisors $>$ PM $>$
  2nd, 3rd molar

Blue – Brown discoloration
Accelerated attrition

Deciduous teeth affected $>$ permanent teeth
Treatment

- Preservation of vertical dimension of occlusion
- Continued commitment & support to both child & family
- Stainless steel crowns to protect against attrition
- Initial composite build – up for anterior teeth to be replaced by veneers later
- Overdentures / implants later

DI – I, II

DI – III (Shell teeth)
Pre-eruptive intracoronal resorptive defects

- Dentine lesions on unerupted teeth
- Detected on routine dental radiographs – erroneously as ‘dentine cysts’ or ‘pre-eruptive caries’
- Result of coronal resorption
- Lesion is empty/ amorphous tissue filled

Treatment
Restored conservatively
Dentin Dysplasia

Normal enamel, atypical dentin with abnormal pulp morphology

Classification

<table>
<thead>
<tr>
<th>Shield</th>
<th>Witkop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Radicular dentin dysplasia</td>
</tr>
<tr>
<td>Type II</td>
<td>Coronal dentin dysplasia</td>
</tr>
</tbody>
</table>
**Type I (radicular)**
Radiographically,
Deciduous dentition: Pulp complete obliteration.
Permanent dentition: Crescent shape.

**Type II (coronal)**
Radiographically,
Deciduous teeth: Pulp chamber-obliterated
Permanent teeth: Thistle tube shape.
Classification

Radicular

Type Ia  Type Ib  Type Ic  Type Id

Coronal

"Thistle -- Tube" pulp

Deciduous teeth - complete obliteration

000 1991:119-25
Differential Diagnosis

- Fibrous dysplasia of dentin: Autosomal dominant disorder
- Pulpal dysplasia

Clinical significance

- Premature exfoliation
- Pulp vascular channels close to DEJ
- Periapical lesions

Also called: ‘Rootless Teeth’
**Treatment**

**Type I**
- Preventive care
- Periapical lesions – guided by root length
  - Moderate - Mechanical creation of canal path
  - Short roots – Pulpal ramification
  - Periapical curettage & retrograde filling

**Type II**
- Endodontic therapy - accomplished readily
Regional Odontodysplasia

*Synonyms*: Ghost teeth, Odontogenesis Imperfecta, Arrested tooth development

**Etiology**: Idiopathic

**Proposed causes**
1. Abnormal migration of neural crest cells
2. Local trauma/infection
3. Local circulatory deficiency
4. Irradiation
5. Metabolic/nutritional deficiency
6. Hyperpyrexia
7. Rh incompatibility
Prevalence: Uncommon

F: M = 1.4 : 1

Clinical Features

Permanent = Deciduous
Max > Mand, Unilateral,
Anteriors > Posteriors
Yellow – Brown discoloration
Delay / failure of eruption
Rough surface
Deficient enamel & dentin
Premature exfoliated
Overall management of dental anomalies – pediatric dentists

- Informing & supporting child & parent
- Establishing a diagnosis
- Genetic counselling
- Inter-disciplinary formulation of definitive treatment plan
- Elimination of pain
- Restoration of aesthetics
- Provision for adequate function
- Maintenance of occlusal vertical dimension
- Intermediate restorations through childhood & adolescence
- Planning definitive treatment at optimum age
THANK YOU