Development

• The process of an individual organism growing organically; a purely biological unfolding of events involved in an organism changing gradually from a simple to a more complex level.

• A process in which something passes by degrees to a different stage (especially a more advanced or mature stage).
Disturbances

- Activity that is an intrusion or interruption.
- The act of disturbing something or someone; setting something in motion.
Tooth

- Hard, bonelike structures in the jaws of vertebrates; used for biting and chewing or for attack and defence.
Developmental stages

- Lateral nasal process
- Medial nasal process
- Groove separating the maxillary process from the lateral nasal process (naso-optic groove)
- Maxillary process
- Groove separating the maxillary process from the medial nasal process (bucconasal groove)
OROFACIAL CLEFTS

Bilateral cleft lip

Cleft of the upper lip
Cleft palate resulting in Oro-nasal communication
Bifid uvula
Submucosal palatal cleft
Pierre robin sequence

Micrognathic mandible with cleft palate
Commissural lip pits

Paramedian lip pits
( Van der woude syndrome)
LIP ANOMALIES

Double lip
Redundant fold of tissue on the upper lip

Aschers syndrome
Blepharochalasis
Leukoedema

*White, wrinkled appearance of buccal mucosa*
Fordyce’s granules

*Multiple yellow-white papular lesion*

*Sebaceous glands below the epithelium*
Developmental disturbances

In

TEETH
Developmental disturbances of teeth

- Size of teeth
- Shape of teeth
- Number of teeth
- Structure of teeth
- Growth (Eruption) of teeth
D-D in size of teeth

- Microdontia
- Macrodontia
D-D in shape of teeth

- Gemination
- Fusion
- Concrescence
- Dilaceration
- Talon cusp
- Dens in dente
- Dens evaginatus
- Taurodontism
- Supernumerary roots
D-D in number of teeth

• Anodontia
• Supernumerary teeth
• Pre-deciduous dentition
• Post-permanent dentition
D-D in structure of teeth

- Amelogenesis imperfecta
- Environmental enamel hypoplasia
- Dentinogenesis imperfecta
- Dentin dysplasia
- Regional odontodysplasia
- Dentin hypocalcification
D-D of growth (eruption) of teeth

- Premature eruption
- Eruption sequestrum
- Delayed eruption
- Multiple unerupted teeth
- Embedded and impacted teeth
- Ankylosed deciduous teeth
Developmental disturbances in size of teeth
Microdontia

• It described teeth which are smaller than normal i.e. outside the usual limits of variation.

• Three types:
  – True generalized
  – Relative generalized
  – Involving a single tooth
Microdontia

• **True generalized type:**
  – All the teeth are smaller than normal.
  – Exceedingly rare.
  – Teeth are well formed but small in size.
  – Seen in Pituitary dwarfism, Down’s syndrome.
Microdontia
Microdontia

• **Relative generalized type:**
  – Normal or slightly smaller than normal teeth, but the **jaws are somewhat larger than normal** — impression of microdontia.
  – *Inheritance* of jaw size from one parent and tooth size from other parent can lead to this variations.
Microdontia

• **Involving a single tooth:**
  – Also called **localized microdontia.**
  – Rather common.
  – Affects mostly the **maxillary lateral incisor and third molars** (Congenitally missing teeth too).
  – **Supernumerary teeth** are frequently small in size.
  – Can be seen in **Facial Hemiatrophy.**
Microdontia
Microdontia

- Common form in lateral incisors – PEG laterals.
  - The mesial and distal surfaces converge or taper incisally forming a peg-shaped or cone-shaped crown.
  - The roots are frequently shorter than normal.
Microdontia
Macrodontia

- It refers to **teeth that are larger than normal**.
- Also called Megalodontia or megadontia.
- Three types:
  - True generalized macrodontia
  - Relative generalized macrodontia
  - Macrodontia of single teeth
Macrodontia

• **True generalized type:**
  – Extremely rare.
  – **All the teeth** are larger than normal.
  – Associated with **pituitary gigantism**.
Macrodontia

• **Relative generalized type:**
  – Some what more common.
  – Normal or slightly larger sized teeth in smaller jaws.
  – Hereditary factors.
Macrodontia

- **Involving a single tooth:**
  - Relatively uncommon.
  - Unknown etiology.
  - Tooth may appear normal in every aspect except for its size.
  - Should not confused with fusion of teeth.
  - Can be seen in *facial hemi-hypertrophy* of the face – the teeth of involved side may be larger than unaffected side.
Macrodontia
Developmental disturbances in shape of teeth
Gemination

• These are anomalies which arise from an attempt at division of single tooth germ by invagination, with resultant incomplete formation of two teeth.
• Hereditary factors may play a role.
• Difficulty to delineate this from fusion of a normal and supernumerary tooth.
Gemination

• Seen in deciduous and permanent teeth, with the higher frequency in the anterior and maxillary region.

• Structure is one tooth with:
  – Two completely or incompletely separated crowns.
  – Roots are single with a root canal.

• **Twinning** – designate the production of equivalent structures by division resulting in one normal and one supernumerary tooth.
Gemination
Fusion

- Fused teeth arise through union of two normally separated tooth germs.
- Could be between two normal teeth or a normal tooth with a supernumerary tooth like mesiodens or distomolar.
- Fusion may be complete or incomplete based on the stage of tooth development at the time of fusion.
- Physical force or pressure produces contact of developing teeth and their subsequent fusion.
Fusion
Fusion
Fusion

- Contact occurs **before calcification** – two teeth may be completely united to form a single large tooth.
  - Dentin is confluent in true fusion.
- Contact **after calcification** of the crowns, the roots may be united.
Fusion
Fusion

- Tooth may have **separate or fused root canals**.
- Common in **deciduous** as well as **permanent** teeth.
- Clinical problems include esthetics, spacing and periodontal conditions.
Concrescence

• A form of fusion which occurs after root formation has been completed.
• Teeth are united by cementum only.
• Due to:
  – Traumatic injury.
  – Crowding of teeth with resorption of adjacent interdental bone – contact of two roots – fused by cementum deposition.
Concrescence
Concrescence

- May occur before or after tooth eruption.
- Usually involves two teeth. But a case involving three teeth has been reported.
- Diagnosed by radiographic examination.
- Should be noted during extraction procedures.
Histopathology

- Deposition of excessive cementum over the original layer of primary cementum.
- May be hypocellular or exhibit areas of cellular cementum resembling bone called osteocementum.
- Polarized light to differentiate dentin and cementum.
Factors asso.

• Local factors:
  – Abnormal occlusal trauma
  – Adjacent inflammation
  – Unopposed teeth – impacted, embedded, without an antagonist
Factors asso.

• **Systemic factors:**
  – Acromegaly and pituitary gigantism
  – Arthritis
  – Calcinosis
  – Paget’s disease of bone
  – Rheumatic fever
  – Thyroid goiter
  – Vitamin A deficiency
Dilaceration

• Refers to an angulation or a sharp bend or curve, in the root or crown of a formed teeth.
• Due to trauma during tooth formation, the position of calcified portion of the tooth is changed and the remaining tooth develops at an angle.
Dilaceration
Dilaceration

- Dilaceration in a permanent tooth often follows traumatic injury (avulsion or intrusion) to the deciduous predecessor in which the tooth is driven apically into the jaw.
- Can also develop secondary to adjacent cyst, tumor or odontogenic hamartoma.
Dilaceration

- The curve or bend can occur anywhere along the length of the tooth depending on the amount of tooth formed at the time of injury.
- Can be problematic during extractions – need for pre-operative radiographs.
Talon cusp

- An anomalous structure resembling an eagle’s talon, projects lingually from the cingulum areas of a maxillary or mandibular permanent incisor.
- This cusp blends smoothly with the lingual tooth surface except for a deep developmental groove.
- Composed of normal enamel, dentin and a horn of pulp tissue.
Clinical features
Radiographic features
Talon cusp

• Clinical problems include esthetics, caries control and occlusal accommodation.
• Quite uncommon among the general population.
• May be seen in other somatic and odontogenic anomalies.
Talon cusp

• More prevalent in Rubinstein – Taybi syndrome.
  – Developmental retardation.
  – Broad thumbs and great toes.
  – Characteristic facial features.
  – Delayed or incomplete descendent of testes in males.
  – Stature, head circumference and bone age below the 15th percentile.
Dens in dente

- Also called Dens invaginatus, Dilated composite odontome.
- Is a developmental variation thought to arise as a result of invagination in the surface of a tooth crown before calcification has occurred.
Dens in dente

- Cause could be:
  - Increased localized external pressure
  - Focal growth retardation
  - Focal growth stimulation
    (in certain areas of the tooth bud)
Dens in dente

- Permanent *maxillary lateral incisors* are most frequently involved and sometimes, the maxillary central incisor and some posterior teeth.
- *Frequently bilateral.*
- *Radicular variety* with a radicular invagination results from infolding of hertwig’s sheath and origin is within the root after development is complete.
Dens in dente

• **Fairly common** and extreme variations in clinical presentation.

• The term was initially applied to a severely invaginated tooth which appeared radiographically as a tooth within a tooth – it is a **misnomer** but continued to be used.
Dens in dente
Dens in dente

- Mild form – has an accentuation/deep invagination in the lingual pit area.
- Radiographs reveal a pear shaped invagination of enamel and dentin with a narrow constriction at the opening on the surface of the tooth and closely approximating the pulp in its depth.
- Food debris can accumulate leading to caries and pulpal infection.
Radiographic features
Dens in dente

- Severe form – an invagination that extends nearly to the apex of the root.
- Bizarre radiographic picture with severe disturbance in the normal anatomic and morphologic structure of the teeth.
- It should be recognized early and restored prophylactically. It could be detected in radiographs even before the tooth erupts.
Dens evaginatus

- Also called Leong’s premolar, Evaginated odontome.
- It is a developmental condition that appears clinically as an accessory cusp or a globule of enamel on the occlusal surface between the buccal and lingual cusps of premolars, unilaterally or bilaterally.
Dens evaginatus

- Evolves by proliferation and evagination of an area of the inner enamel epithelium and subjacent odontogenic mesenchyme into the dental organ during early tooth development.
Dens evaginatus

• May physically resemble talon cusp.
• Extra cusp can lead to:
  – Incomplete eruption
  – Displacement of teeth
  – Pulp exposure following occlusal wear or fracture.
Dens evaginatus
Shovel shaped incisors

- Predominantly in asians, native americans and alaskans.
- Affects maxillary central and lateral incisors.
- Has prominent lateral margins creating a hollowed lingual surface resembling the scoop of a shovel.
- Thickened marginal ridges converge at the cingulum. There is a deep pit, fissure or dens invaginatus at this junction.
Taurodontism

- Originated by Sir Arthur Keith in 1913 to describe a dental anomaly in which the body of the tooth is enlarged at the expense of the roots.
- Means bull-like tooth as it is similar to teeth in ungulate or cud-chewing animals.
- It is an enlargement of the body and pulp chamber of a multi-rooted tooth with apical displacement of the pulpal floor and bifurcation of the roots.
Taurodontism

• Shaw classified it as,
  – Hypotaurodont – mildest form
  – Mesotaurodont – moderate
  – Hyperataurodont – severe form with furcation near the apices of the roots.
Taurodontism

• Causes enumerated by Mangion are:
  – Primitive pattern
  – Mutation resulting from odontoblastic deficiency during
dentinogenesis of the roots.
• Could be due to failure of Hertwig’s epithelial sheath to
  invaginate at the proper horizontal level.
• Appears to be genetically controlled and familial in
  nature.
Taurodontism

• Associated in Neanderthal man.
• Occur concomitantly with amelogenesis imperfecta - hypomaturation-hypoplastic variety.
• Reported in Klinefelter’s syndrome.
Taurodontism
Taurodontism

• Affect either deciduous or permanent teeth (more common in permanent teeth).
• Usually molars – single/multiple.
• Unilateral or bilateral involvement.
• No unusual morphology.
Taurodontism

- Affected teeth tend to be **rectangular** in shape.
- **Pulp chamber is extremely large** with greater apico-occlusal height.
- Pulp lacks the usual cervical constriction.
- **Roots are extremely short.**
- **Furcation near the apices of the roots.**
Syndromes asso.

- AI – Type IE, IV
- Ectodermal dysplasia
- Hyper/Hypo phosphatasia
- Klinefelter syndrome
- Oculo-dental-digital dysplasia
- Tricho-dento-osseous syndrome
- Down’s syndrome
- Sex chromosomal aberrations
Supernumerary roots

• Refers to the development of an increased number of roots on a tooth compared with that described in dental anatomy.
• May involve any tooth.
• Mandibular cuspids and bicuspids may have two roots.
• Maxillary and mandibular molars may exhibit additional roots.
• Significant during extraction.
Supernumerary roots
Ectopic enamel

- Refers to the presence of enamel in unusual locations, mainly in the roots of teeth.
- Widely known as enamel pearls.
- Project from the surface of the root.
Ectopic enamel

• Hemispheric structures that consist of,
  – Entirely of enamel
  – Enamel, dentin and pulp tissue.
• Thought to arise from localized bulging in the odontoblastic layer with prolonged contact between HERS and dentin leading to enamel formation.
• Cervical enamel extensions also occur along the root surface.
Ectopic enamel

Figure 2-76 • Enamel pearl. Mass of ectopic enamel located in the furcation area of a molar tooth. (Courtesy of Dr. Joseph Beard.)
Cervical enamel extensions

- Located on the buccal surface of the root overlying the bifurcation.
- Affects the mandibular molars.
- Greater prevalence in Asians.
Cervical enamel extensions

• Correlated with localized loss of periodontal attachment with furcation involvement.
• Associated with development of inflammatory cysts – Buccal bifurcation cysts.
Developmental disturbances in number of teeth
Anodontia

• **True** anodontia – congenital absence of teeth.
  – Total
  – Partial
• **Induced or false** anodontia – as a result of extraction of all teeth.
• **Pseudo**-anodontia – applied to multiple, unerupted teeth.
Total anodontia

- It is a rare condition in which **all the teeth are missing**.
- May involve both deciduous and permanent dentition.
- Frequently associated with **hereditary ectodermal dysplasia**.
True partial anodontia

• Also called
  – **Hypodontia** – lack of development of one or more teeth.
  – **Oligodontia** - Lack of development of six or more teeth.

• Is a common condition involving one or more teeth.

• Any tooth can be congenitally missing.
Hypodontia
True partial anodontia

• Etiology:
  – Familial tendency – point mutations transmitted in autosomal dominant pattern.
  – Missing third molars could be an evolutionary trend towards fewer teeth.
  – In association with hereditary ectodermal dysplasia.
  – Xray radiation of face during early age – affecting the sensitive tooth buds.
True partial anodontia

• Frequently involved teeth are,
  – Third molars (all the 4 may be missing)
  – Maxillary lateral incisors
  – Maxillary and mandibular second premolars

• Bilateral involvement is also seen.
Hypodontia
True partial anodontia

- In **severe partial anodontia** - there is bilateral absence of corresponding teeth.

- In **hereditary ectodermal dysplasia** – few teeth that are present may be deformed or **cone shaped**.
True partial anodontia

- Congenitally missing **deciduous teeth** is an uncommon condition.
- Usually involves,
  - Maxillary lateral incisors
  - Mandibular lateral incisors
  - Mandibular cuspids
- The term partial anodontia should be avoided as by Allen.
Syndromes asso.

- Ankyloglossia superior
- Crouzon
- Down
- Ectodermal dysplasia
- Ehlers danlos
- Hurlers
- Sturge-weber
- Turner
- Incontinentia pigmenti
- Ellis von creveld
Hyperdontia

- Development of an increased number of teeth and the additional teeth are termed as **supernumerary teeth**.
Supernumerary teeth

- It may **closely resemble** the teeth of the belonging group – molars, premolars or incisors.
- It may have **no resemblance** in size and shape to the associated tooth.
Supernumerary teeth
Supernumerary teeth

- It develops from a **third tooth bud** arising from the dental lamina near the permanent tooth bud.
- Arises by **splitting of the permanent bud itself** (unlikely as the associated permanent tooth is normal in all aspects).
- Hereditary tendency.
Supernumerary teeth

• Multiple SN teeth is seen in,
  – Cleido-cranial dysplasia
  – **Gardner’s syndrome** – the impacted teeth may lead to early diagnosis of entire syndrome (malignant transformation of intestinal polyps).

• Most of these SN teeth are frequently impacted.
Supernumerary teeth

- May be found in any location.
- 90% of occurrence is in the maxilla.
- May be erupted or impacted.
Mesiodens

- **Most common** supernumerary tooth.
- It is situated **between the maxillary central incisors**.
- It occurs as,
  - Single or paired.
  - Erupted or impacted or inverted.
Mesiodens

Figure 2-43 *Hyperdontia (mesiodens). Erupted super-

{

}
Mesiodens

• It is a **small tooth with a cone shaped crown and a short root.**

• High incidence in caucasian population with 2:1 male predilection (Transmitted as an autosomal dominant trait).
Mesiodens
Fourth molar

• Second most common supernumerary tooth.
• Situated distal to the third molar.
• Usually small, rudimentary tooth but may be of normal size.
• Maxillary 4th molar is more common than mandibular 4th molar.
• An accessory fourth molar is called Distomolar or distodens.
Fourth molar
Supernumerary teeth

• Others include,
  – Maxillary paramolars
  – Mandibular premolars
  – Maxillary lateral incisors
• Rarely – mandibular central incisors and maxillary premolars.
Paramolars

• **Paramolar** is a supernumerary molar,
  – Situated buccally or lingually to one of the maxillary molars.
  – Inter-proximally between the first and second molars
  – Inter-proximally between second and third molars.

• Usually small and rudimentary.
Dental transposition

• **Normal teeth erupting into an inappropriate position.**
• Usually involves the canine and first premolars.
• Canine erupting between two premolars.
• Could be **confused with supernumerary teeth.**
Syndromes asso.

- Apert
- Cleidocranial dysplasia
- Crouzon
- Down
- Ehler danlos
- Gardner
- Sturge-weber
- Fucosidosis
Pre-deciduous dentition

- Infants born with structures appearing to be erupted teeth in the mandibular incisor region.
- Arising from,
  - An accessory bud of the dental lamina ahead of the deciduous tooth bud.
  - The bud of accessory dental lamina.
Pre-deciduous dentition

• Described as hornified, epithelial structures without roots.
• Occurs in the gingiva over the crest of the ridge
• May be easily removed.
Pre-deciduous dentition

• Differentiated from true deciduous teeth or natal teeth described by Massler – which erupts at the time of birth.
• Some consider it as a misinterpretation of dental lamina cysts of new born,
  – Projects above the crest of the ridge.
  – White in color.
  – Packed with keratin – hornified appearance.
  – Easily removed.
Post-permanent dentition

- In persons who had **all their permanent teeth extracted** and yet had **subsequently erupted several more teeth particularly after insertion of complete denture**.
- Majority is due to **delayed eruption of retained or embedded teeth**.
Post ‐ permanent dentition

• Some may represent post ‐ permanent or third dentition.
• But they are actually, multiple supernumerary unerupted teeth.
• It probably develops from a bud of the dental lamina beyond the permanent tooth germ.
Developmental disturbances in structure of teeth
Environmental alterations

- Developmental tooth defects
- Post developmental structure loss
- Discolorations of teeth
- Localized disturbances in eruption.
Environmental enamel hypoplasia

• Defined as incomplete or defective formation of the organic enamel matrix of the teeth.

• Two types:
  – Hereditary – AI
  – Caused by environmental factors
Factors associated with enamel defects

• **Systemic factors:**
  – Birth related trauma – hypoxia, premature birth
  – Chemicals – Fluoride, anti-cancer drugs
  – Chromosomal abnormalities – Trisomy 21
  – Infections
  – Inherited diseases
  – Malnutrition
  – Metabolic disorders
  – Neurologic disorders
Factors associated with enamel defects

- **Local factors:**
  - Local acute mechanical trauma
  - Electric burn
  - Irradiation
  - Local infection
## Environmental enamel hypoplasia

<table>
<thead>
<tr>
<th>Hereditary</th>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both deciduous and permanent teeth are affected.</td>
<td>Either dentition may be involved. Sometimes, only a single tooth.</td>
</tr>
<tr>
<td>Only enamel is affected.</td>
<td>Both enamel and dentin are involved.</td>
</tr>
</tbody>
</table>
Amelogenesis imperfecta

- Also called hereditary enamel dysplasia, hereditary brown enamel, hereditary brown opalescent teeth.
- It represents a group of hereditary defects of enamel unassociated with any other generalized defects.
- It is entirely an ectodermal disturbance and the mesodermal components of the teeth are basically normal.
Amelogenesis imperfecta

• In normal development of enamel, three stages can be appreciated,
  – Formative stage – deposition of organic matrix – defective – Hypoplastic AI.
  – Calcification stage – matrix mineralization – defective – Hypocalcification (Hypomineralization) AI.
  – Maturation stage – Crystallites mature and enlarge – defective – Hypomaturation AI (immature crystallites).
Classification by Witkop and Sauk

- **Hypoplastic:**
  - Pitted, autosomal dominant
  - Local, autosomal dominant
  - Smooth, autosomal dominant
  - Rough, autosomal dominant
  - Rough, autosomal recessive
  - Smooth, X-linked dominant

- **Hypocalcified:**
  - Autosomal dominant
  - Autosomal recessive

- **Hypomaturation:**
  - Hypomaturation - hypoplastic with tarudontism, autosomal dominant.
  - X-linked recessive.
  - Pigmented, autosomal recessive
  - Snow capped teeth.
Classification

- Hypoplastic pattern – IA, IB, IC, ID, IE, IF, IG
- Hypomaturation – IIA, IIB, IIC, IID
- Hypocalcified – IIIA, IIIB
- Hypomaturation – Hypoplastic – IVA
- Hypoplastic – Hypomaturation - IVB
Clinical features

• By Witkop and Sauk,
  – **Hypoplastic** – enamel is not formed to full, normal thickness on newly erupted, developing teeth.
  – **Hypocalcified** – enamel is so soft that it can be removed by prophylaxis instrument.
  – **Hypomaturation** – enamel can be pierced by an explorer point under firm pressure and can be lost by chipping off from the underlying normal dentin.
Clinical features

• Extremely variable, clinical presentation.
• All teeth of both dentitions affected to some degree.
• Crowns may show **discoloration** varying from yellow to dark brown.
Clinical features

- Enamel may be totally lost or have chalky texture or cheesy consistency or relatively hard.
- Enamel may be smooth or show vertical wrinkles or grooves.
- May be chipped or show depressions with exposed dentin at its base.
- Contact points are open
- Occlusal and incisal edges are severely abraded.
Hypoplastic generalized pitted pattern

Pin-point to pinhead sized pits on the buccal surface of the teeth

Diffuse involvement of all maxillary teeth
Hypoplastic autosomal dominant smooth pattern

Yellowish teeth exhibiting hard glossy enamel with open contact points and anterior open bite
Amelogenesis imperfecta
Amelogenesis imperfecta
Hypoplastic rough pattern

Small yellow teeth with rough enamel surface, open contact points, significant attrition and anterior open bite
Hypomaturation type

Mottled opaque white enamel with scattered areas of brown discoloration

White opaque enamel in the incisal and occlusal one fourth of the enamel surface
Hypocalcified amelogenesis imperfecta.

Diffuse yellow brown discoloration, loss of coronal enamel
Radiographic features

• Overall shape of the tooth may not be normal depending on the,
  – Amount of enamel present
  – Amount of occlusal and incisal wear
• Enamel may be totally absent or seen only on the cusp tips and inter-proximal surfaces.
• It may have similar radiodensity to dentin.
Histologic features

- Disturbance in the differentiation and viability of ameloblasts in hypoplastic type – seen as **defective matrix formation** – even total absence of matrix.
- Hypocalcification type shows **defects in matrix structure and mineral deposition**.
- Hypomaturation type shows **alterations in enamel rods and rod sheath structures**.
Hypoplastic/Hypomaturation AI

- Has enamel hypoplasia in combination with hypomaturation.
- Both the dentition are affected.
- Two patterns based on thickness of enamel and overall tooth size.
Hypomaturation - Hypoplastic

• Enamel hypomaturation is the dominant feature.
• Enamel is yellowish-white to yellowish-brown.
• Pits are seen on buccal surface.
• Enamel is similar to dentin in density.
• Large pulp chambers with varying degrees of taurodontism.
Hypoplastic - Hypomaturation

- Enamel hypoplasia is the dominant feature.
- Enamel is thin.
- Other features is similar to the forementioned type.
Tricho-dento-osseous syndrome

• Autosomal dominant disorder.
• Shows hypoplastic-hypomaturation with severe taurodontism.
• Kinky hair at birth which may straighten with age.
• Osteosclerosis of the base of skull and mastoid process.
• Mandible exhibits shortened ramus and an obtuse angle.
• Brittle nails.
Tricho-dento-osseous syndrome

The syndrome is mentioned here because the diagnosis may not be readily apparent without a high index of suspicion. In addition to the dental findings, the prominent systemic changes are present in the individual and include thickened skin, abnormal nails, and teething anomalies. The syndrome is often characterized by a high disclike decompression at the disclike decompression. The syndrome is often characterized by a high disclike decompression at the disclike decompression. The syndrome is often characterized by a high disclike decompression at the disclike decompression.
Environmental enamel hypoplasia

• It occurs only when the injury occurs during the development or more specifically, formative stage of enamel.
• Once the enamel is calcified, no such defect can be produced.
• By correlating the chronology and location of the defect, the approximate time of injury could be predicted.
Causes

- Nutritional deficiency – Vitamins A, C, D
- Exanthematous diseases – Measles, Chicken pox, Scarlet fever
- Congenital syphilis
- Hypocalcemia
- Birth injury, prematurity, Rh hemolytic disease
- Local infection or trauma
- Ingestion of chemicals – fluoride
- Idiopathic causes.
Clinical features

- **Mild cases** – few small grooves, pits or fissures on the enamel surface.
- **Severe** – rows of deep pits arranged horizontally across the surface of the tooth.
- Several rows indicate series of injuries.
- **Most severe** – enamel may be absent.
Hypoplasia due to nutritional factors and exanthematous fevers

- **Rickets** at the time of tooth formation is the most common cause.
- Serious nutritional deficiency or systemic disease is potentially capable of producing enamel hypoplasia as the ameloblasts are one of the most sensitive groups in terms of metabolic function.
Hypoplasia due to nutritional factors and exanthematous fevers

- Most cases involve teeth that form within the first year after birth.
- **Maxillary central and lateral incisors, cuspids** (tip of cuspids forms before the lateral incisor) and **first molars** are frequently affected.
- Premolars, 2\textsuperscript{nd} and 3\textsuperscript{rd} molars are seldom affected – formation is 3 years or later.
- Decay progresses rapidly in hypoplastic teeth.
Hypoplasia due to congenital syphilis

- Has a characteristic, pathognomonic appearance.
- Involves the maxillary and mandibular permanent incisors and first molars.
- Anteriors – “Hutchinson’s teeth”
- Posteriors – “Mulberry molars, Moon’s molars, Fournier’s molars”.
Clinical features

- Upper central incisor is screw-driver shaped.
- Mesial and distal surfaces of the crown tapers and converges towards the incisal edge of the tooth.
- **Incisal edge is usually notched** – could be due to the absence of central tubercle or calcification center.
Hutchinson’s incisors
Clinical features

- Crowns of first molars are irregular.
- Enamel of the occlusal surface and occlusal third of the tooth appears to be an agglomerate mass of globules.
- Crown is narrower on the occlusal surface than at the cervical margins.
- All the patients do not exhibit dental findings.
Mulberry molars
Hypoplasia due to hypocalcemia

- **Tetany** - due to reduction in blood level of calcium – due to vitamin D deficiency and hypo-parathyroidism.
- Calcium level falls to 6-8mg/dl and can affect the developing tooth.
- Hypoplasia is of the pitting variety.
Hypoplasia due to birth injuries

• **Neonatal line or ring** – described by Schour (1936) is present in deciduous teeth and first permanent molars.
• Considered as a hypoplastic defect in enamel and dentin due to trauma or environmental change at the time of birth.
• More common in premature infants and in Rh hemolytic diseases.
• Can even involve prenatal enamel – due to GI disturbances or other illnesses in the mother.
Hypoplasia due to local trauma or infection

• Only a **single tooth** is involved – permanent maxillary incisors or maxillary/mandibular premolar.

• Single teeth are frequently referred as **Turner’s teeth** and the condition is called as **Turner’s hypoplasia**.

• Mild, brownish discoloration to severe pitting.
Horizontal enamel hypoplasia of the bicuspid and second molars

Turners hypoplasia of mandibular bicuspid
Turner's
Hypoplasia due to local trauma or infection

• The periapical infection of a carious deciduous tooth can disturb the developing ameloblastic layer of the succeeding permanent tooth producing hypoplastic crown.

• Severity of the hypoplasia depends on the,
  – Severity of the infection
  – Degree of tissue involvement
  – Stage of permanent tooth development at the time of infection.
Hypoplasia due to local trauma or infection

- Similar hypoplasia can follow trauma to the deciduous tooth when the tooth is driven into the alveolus and damages the developing permanent successor.
- Usually affects the labial surface of maxillary anteriors.
- Seen as yellowish or brownish stain or pigmentation of enamel on the labial surface or as a pitted hypoplasia.
- Could be due to disturbance in matrix formation or calcification.
Hypoplasia due to trauma
Hypoplasia due to anti-neoplastic therapy

- Secondary changes due to therapeutic radiation or chemotherapy.
- Under the age of 5 years.
- Hypodontia, microdontia, radicular hypoplasia and enamel hypoplasia.
- Reduced alveolar bone development.
Hypoplasia due to fluoride – Mottled enamel

- Variety of enamel hypoplasia.
- First described by G.V. Black and Frederick S. Mckay in 1916 – Colorado brown stain.
- Exhibited a geographic distribution and due to the water supply.
- Later, the causative agent was found to be flourine.
Etiology

• Ingestion of fluoride containing drinking water during the time of tooth formation.
• Severity of hypoplasia increases with concentration of fluoride in water.
• Little mottling at 0.9 to 1.0 ppm of Fluoride.
Pathogenesis

- Due to disturbance of ameloblasts during the formative stage of tooth development.
- Exact nature of cell injury is not known but the enamel matrix is defective or deficient.
- Findings may be related to individual variations to fluoride intake.
- High levels of fluoride interferes with calcification of the matrix.
Clinical features

- **Questionable changes** - white flecks or spotting of enamel.
- **Mild changes** – white, opaque areas involving more of tooth surface.
- **Moderate and severe changes** – pitting and brownish staining of the surface. Tendency of enamel to wear or fracture.
- **Corroded surface** of the affected teeth.
Mottled enamel
Mottled enamel
Intrinsic stains

• Congenital erythropoietic porphyria – reddish brown – red fluorescence under Wood’s light.
• Alkaptonuria – bluish black – asso. with Ochronosis
• Hyperbilirubinemia in erythroblastosis fetalis, biliary atresia – green discoloration – cholorodontia.
• Tetracycline – bright yellow to dark brown – bright yellow fluorescence in uv light.
Tetracycline stains
Dentinogenesis imperfecta

- Called Hereditary opalescent dentin, Capdepont’s teeth.
- Only the mesodermal portion of the odontogenic apparatus is affected.
- Dentin is defective.
- Could be due to hereditary factors
- Can be seen in association with osteogenesis imperfecta.
Classification by Shields

• Type I – DI that always occur with OI – autosomal dominant.
• Type II – DI that never occurs with OI – hereditary opalescent dentin – autosomal dominant – 1 in 8000.
• Type III – DI – Brandy wine type – similar to I and II along with multiple pulp exposures in deciduous teeth – autosomal dominant.
Clinical features

- Varied presentations.
- Deciduous teeth are more severely affected in Type I.
- Both the dentitions are equally affected in Type II and III.
- Gray to brownish violet or yellowish brown with a characteristic translucent or opalescent hue.
Dentinogenesis imperfecta
Clinical features

- Enamel may be lost early on incisal and occlusal surfaces due to the abnormal DEJ.
- DEJ lacks the usual scalloping.
- Dentin is attrited rapidly.
- Occlusal surfaces of affected teeth are severely flattened.
Dentinogenesis imperfecta
Radiographic features

- Total or partial obliteration of the pulp chambers and root canals by continued formation of dentin in Type I and II.
- Seen in both dentitions.
- Roots may be short and blunted.
- The cementum, alveolar bone and periodontal bone appear normal.
Radiographic features

- Type III shows marked variation.
- Witkop describes it as Shell teeth.
- Originally described by Rushton as a dentinal disturbance with normal enamel, extremely thin dentin and enormous pulp chambers.
- Roots are extremely short.
Histologic features

- Type I and II emphasizes a pure mesodermal disturbance. Type III is not adequately documented.
- The enamel is normal in appearance.
- Dentin has irregular tubules with large areas of uncalcified matrix.
- Tubules are larger in diameter and lesser in number.
Physical and chemical features

• **Water content** is increased – 60% above normal.
• **Inorganic content** is less than that of normal dentin.
• **Density, Xray absorption** and **hardness of dentin** is low.
• **Micro-hardness** of dentin is close to cementum – rapid attrition.
Histologic features

- Cellular inclusions probably odontoblasts can be seen in dentin.
- The odontoblasts with limited ability to form well-organized dentinal matrix, appear to degenerate readily and get entrapped within the matrix.
- Pulp chamber is obliterated by continuous dentin deposition.
Dentin dysplasia

• Called **Rootless teeth**.
• Rare disturbance in dentin formation characterized by normal enamel but atypical dentin formation with abnormal pulp morphology.
• First described by **Ballschmiede** (1920) – spontaneous exfoliation of multiple teeth.
• **Rushton** (1939) designated it as dentin dysplasia.
Classification

• **Shields:**
  – Type I – dentin dysplasia
  – Type II – anomalous dysplasia of dentin

• **Witkops:**
  – Type I – Radicular dentin dysplasia – More common.
  – Type II – Coronal dentin dysplasia
Etiology

- Hereditary disease.
- Autosomal dominant inheritance.
Clinical features

**Radicular DD**
- Both dentitions are affected.
- Appear clinically normal in morphology and color.
- Slight amber translucency.
- Normal eruption pattern.
- Extreme mobility of teeth and premature exfoliation due to abnormally short roots.

**Coronal DD**
- Both dentitions are affected.
- Deciduous teeth are yellow, brown or bluish-grey opalescent appearance as DI.
- Permanent dentition is normal.

In both dentitions, roots are short, blunt, conical or similarly malformed.
Dentin dysplasia
Radiographic features

- Pulp chambers and root canals are completely obliterated in deciduous teeth.
- Crescent shaped pulpal remnant in the pulp chamber of permanent teeth.
- Obliteration of permanent teeth occurs pre-eruptively.
- Periapical radiolucencies of apparently, intact teeth.

- Pulp chambers of deciduous teeth are obliterated.
- Permanent teeth shows abnormally, large pulp chamber in the coronal portion of the tooth – thistle tube in shape. Radio-opaque foci resembling pulp stones may be found.
- Obliteration does not occur before eruption.
- Periapical radiolucencies do not occur.
Dentin dysplasia
Histologic features

- A portion of coronal dentin is usually normal.
- Pulp is obliterated by calcified, tubular dentin, ostodentin and fused denticles.
- Normal dentinal tubule formation appears to be blocked and dentin forms around obstacles – Lava flowing around boulders.
- EM – cascades of dentin due to repeated attempts of root formation.

- Coronal dentin is relatively normal.
- Deciduous teeth shows amorphous and atubular dentin in the radicular portion.
- Permanent teeth has multiple pulp stones or denticles.
Dentin dysplasia

• **Systemic diseases** with DD like alterations are
  – Calcinosi...
Fibrous dysplasia of dentin – DD I

• Autosomal dominant disorder
• Clinically normal teeth
• Has a radio-dense, intra-pulpal material (fibrotic dentin) filling the pulp chambers and canals.
• Small foci of radiolucency can be seen in the pulp (D/D – DI)
• No crescent pulp chambers and no decrease in root length (D/D – DD)
Pulpal dysplasia – DD II

- Develops in teeth that are normal clinically.
- Affects both dentitions.
- Radiographs reveal thistle-tube shaped pulp chambers and multiple pulp stones.
Regional odontodysplasia
(Ghost teeth)

• Is a localized, non-hereditary developmental abnormality of teeth with extensive adverse effect on the formation of enamel, dentin and pulp.
Regional odontodysplasia

• Also called odontodysplasia, odontogenic dysplasia, Ghost teeth and Odontogenesis imperfecta.
• Unusual dental anomaly in which one or several teeth in a localized area are affected.
Associated pathoses

- Ectodermal dysplasia
- Epidermal nevi
- Hypophosphatatasia
- Neurofibromatosis
- Vascular nevi
Causes

- **Somatic mutation**
- **Latent virus** residing in the odontogenic epithelium which becomes active during tooth development.
- **Local vascular defects**.
- Abnormal migration of neural crest cells
- Local trauma or infection
- Hyperpyrexia
- Malnutrition
- Medications during pregnancy
- Radiation therapy
- Somatic mutation
Regional odontodysplasia

• Maxillary teeth are frequently involved – *permanent incisors and cuspids.*
• Mandibular anteriors may be affected.
• Both the dentitions are affected.
• Show a *delayed or total failure of eruption.*
• *Irregular in shape* with defective mineralization.
Regional odontodysplasia
Radiographic features

- Marked reduction in radiodensity – teeth assumes a ghost appearance.
- Both enamel and dentin appear very thin.
- Pulp chamber is extremely large.
Regional odontodysplasia
Radiographic features
Histologic features

- Marked reduction in the amount of dentin.
- Widening of predentin layer.
- Large areas of interglobular dentin.
- Irregular trabecular pattern of dentin.
- Reduced enamel epithelium around non-erupted teeth show many irregular, calcified bodies – focal collections of basophilic enamel like calcifications called Enameloid conglomerates.
Other pathologies in asso.

- Ectodermal dysplasia
- Epidermal nevi
- Hypophosphatasia
- Hydrocephalus
- Ipsilateral facial hypoplasia
- Neurofibromatosis
- Orbital coloboma
- Rhesus incompatibility
- Vascular nevi
Dentin hypocalcification

- Caused by environmental factors affecting mineralization.
- There is failure in the fusion of calcium globules during mineralization, leaving interglobular areas of uncalcified matrix.
- Globular dentin can be easily detected in ground and decalcified sections.
- Hypocalcified dentin is softer.
Disturbances of

Growth (eruption) of teeth
Introduction

• There is a marked variation in biologic eruption of deciduous and permanent dentition.
• It is difficult to assess when the eruption date of the given person is outside the limits of the normal range.
• Some cases have extremities of normality and can be considered as a pathology.
Premature eruption

- Deciduous teeth that have erupted into the oral cavity in infants at birth called **Natal teeth**.
- If it erupts prematurely within the first 30 days of life, it is **Neonatal teeth**.
- Usually one or two teeth erupt early – often mandibular deciduous incisors.
Premature eruption

• Reason is unknown.
• **Hormonal influences** like hyperthyroidism, adrenal glands and gonadism, for tooth eruption are also considered.
• These teeth are often **well formed**, normal in all aspects but may **exhibit mobility**.
• It should be retained though nursing difficulties may be experienced.
Premature eruption

- Permanent teeth erupt prematurely as a sequel to the premature loss of deciduous teeth.
- Seen when only a single deciduous teeth is lost with subsequent eruption of the succedaneous tooth.
Eruption sequestrum

- Anomaly associated with tooth eruption in children.
- Described by Starkey and Shafer.
- It is a tiny, irregular spicule of bone overlying the crown of an erupting permanent molar, found just prior to or immediately following the emergence of the tip of the cusps through the oral mucosa.
Etiology

• As the molar teeth erupt through the bone, they can separate a small osseous fragment from the surrounding bone similar to a cork screw.
• In most cases, the fragment undergoes complete resorption before eruption.
• If the bony spicule is large or the eruption is rapid, complete resorption cannot occur and hence, it is observed.
Clinical features

• The child may complain of slight soreness in the area during function.
• The spicule directly overlies the central occlusal fossa but is within the soft tissue.
• It may be seen lying in a tiny depression over the crest of the ridge.
• As the tooth erupts, the fragment of bone completely sequesters through the mucosa and is lost.
Radiographic features

- It can be recognized even before the tooth eruption.
- Seen as a tiny, irregular opacity overlying the central occlusal fossa but separated from the tooth itself.
Delayed eruption

• In deciduous and permanent teeth, it is difficult to assess unless a gross variation is present.

• Caused by,
  – **Systemic** conditions like rickets, cretinism, cleidocranial dysplasia.
  – **Local** factors like fibromatosis gingivae.

• Treatment of the primary condition may lead to eruption of the teeth.
Delayed eruption
Multiple unerupted teeth

• Uncommon condition with delayed eruption of teeth.
  – Deciduous teeth may be retained or
  – Deciduous teeth would be shed but the permanent teeth would have failed to erupt (Pseudo-anodontia).
• Radiographs may be normal but the eruptive forces would be lacking.
• In association with cleidocranial dysplasia.
Embedded and Impacted teeth

• Embedded teeth are individual teeth which are unerupted usually because of a lack of eruptive force.

• Impacted teeth are prevented from eruption by some physical barrier in the eruption path like,
  – Lack of space – crowding, premature loss of deciduous teeth.
  – Rotation of tooth buds.
Embedded and Impacted teeth

- Any tooth may be impacted – usually mandibular third molars (22%), maxillary third molars (18%) and maxillary cuspids (0.9%), premolars and supernumerary teeth.
- Mandibular teeth are more severely impacted than maxillary teeth.
Impacted teeth

Impacted Wisdom Teeth
Impacted mandibular third molars

- Classified based on the position,
  - Mesioangular
  - Distoangular
  - Vertical
  - Horizontal
  - Inverted
  - Deflected buccally or lingually
  - Even seen in the lower border of ramus.
Impacted mandibular molars
Impacted mandibular third molars

- It is important to determine whether it is a complete or partial impaction.
- **Completely impacted tooth** is one which lies completely within the bone and has no communication with the oral cavity. It cannot become infected or carious.
- **Partially impacted tooth** is not completely encased in bone but lies partially in soft tissue. Oral communication could be through a periodontal pocket leading to infection or carious involvement.
Impacted maxillary teeth

- Maxillary third molars can show similar variations of mandibular third molars.
- Maxillary cuspids can be impacted from horizontal to vertical directions.
- Horizontally impacted teeth may impinge on the roots of anteriors or premolars.
- It can be placed labially or palatally.
Complications

- Infection
- Resorption of adjacent roots.
- Periodic pain and even trismus.
- Referred pain from impacted tooth.
- Dentigerous cyst and ameloblastomatous change.
- May undergo resorption from the crown and gets replaced by bone.
1. Infection
When an impacted wisdom tooth starts to push through the gum, an infection can start around the top of the tooth. Infection and inflammation (swollen red gums) can cause pain, swelling, and jaw stiffness.

2. Crowding
A wisdom tooth may push nearby teeth out of their correct position and may help to cause crowding of front teeth.

3. Cysts
Sacs of fluid called cysts can form around the tooth and may displace the tooth. The cysts can destroy bone and damage other teeth and gums.

4. Damage to nearby molars
An impacted wisdom tooth may keep pushing against the molars next to it. This often leads to serious damage to both teeth.
Ankylosed deciduous teeth

- Also called Submerged teeth, Infraocclusion, Secondary retention, Submergence, Reimpaction and Reinclusion.
- Usually deciduous mandibular second molars with variable degree of root resorption can become ankylosed to bone.
Ankylosed deciduous teeth

- This prevents exfoliation and subsequent replacement by permanent teeth.
- After the eruption of adjacent teeth, these ankylosed teeth appears to be submerged from the level of occlusion.
Ankylosed deciduous teeth

- The submerged appearance could be due to
  - Continued growth of the alveolar process
  - Crown height of deciduous tooth is less than that of adjacent permanent teeth.
- It has a **solid sound on percussion** when compared to the dull, cushioned sound of normal teeth.
Ankylosed teeth
Ankylosed deciduous teeth

- Even with extreme root resorption, teeth lack mobility.
- Diagnosis is suspected clinically and confirmed with radiographs.
- There is partial absence of the periodontal ligament with areas of apparent blending between the root of the tooth and alveolar bone.
Complications

- Development of malocclusion
- Local periodontal disturbance
- Dental caries of both the ankylosed tooth and adjacent teeth.
Conclusion