Developmental disturbances of oral & paraoral structures

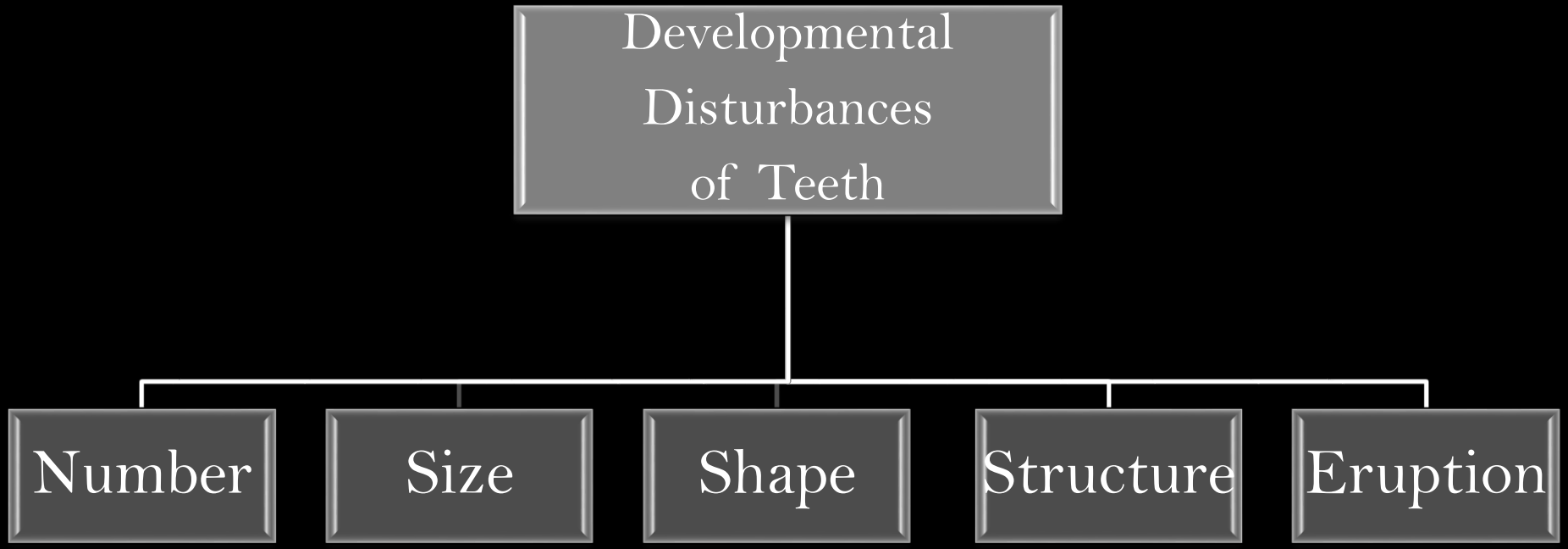
DEPARTMENT OF ORAL AND MAXILLOFACIAL PATHOLOGY & ORAL MICROBIOLOGY

Developmental disturbances of teeth

Development of an ideal dentition

- Formation of a full complement of teeth
- Normal structural (size , shape , structure) development of dental tissues
- Eruption of teeth at the appropriate time into adequate space
- Eruption of teeth into correct relationship to occlude with opposite teeth

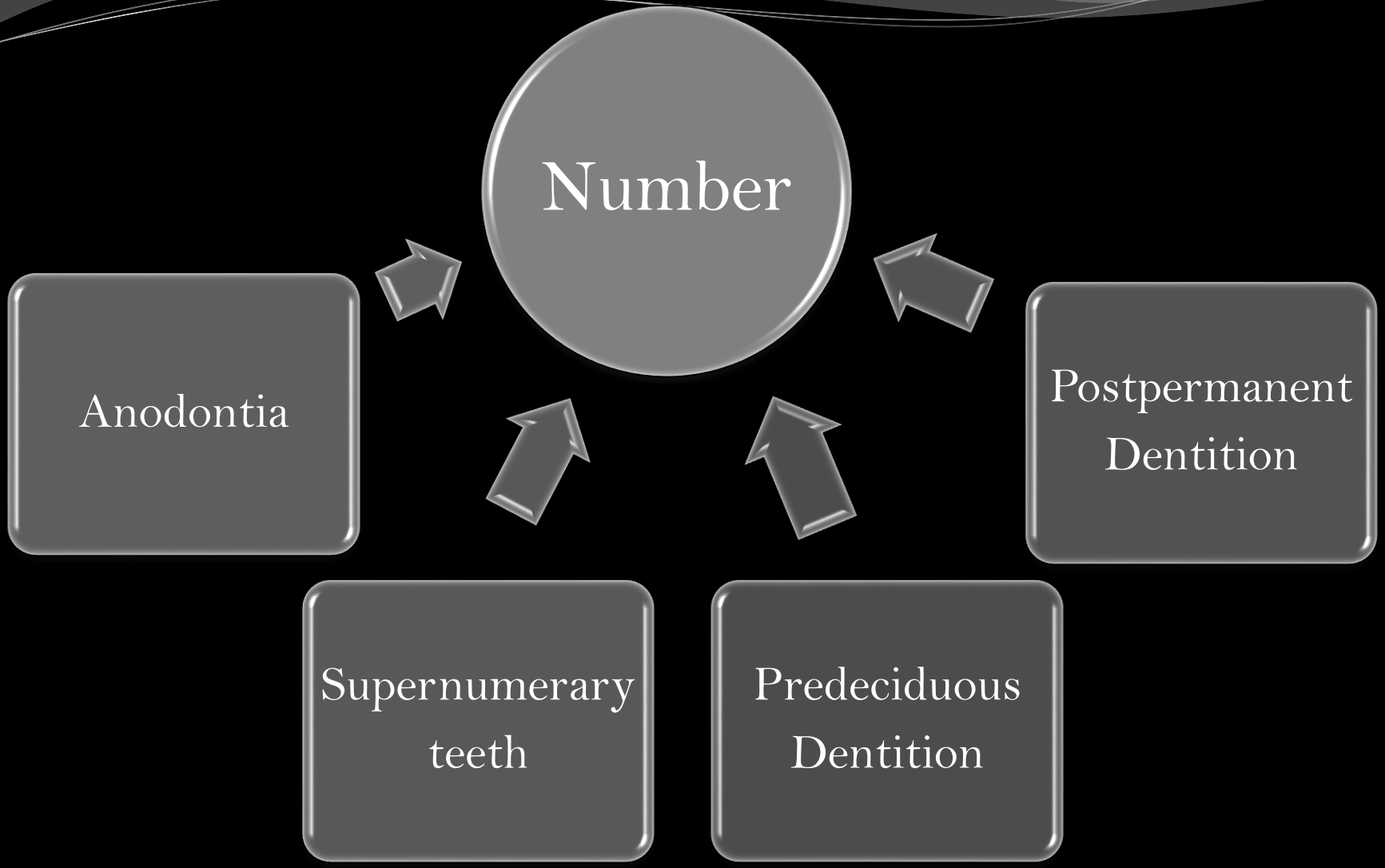
Stage of tooth Development	Anomalies
Initiation	Number
Histo & Morphodifferentiation	Shape
Apposition	Structure
Calcification	Hypocalcification
Eruption	Premature or delayed eruption


Developmental Disturbances of Teeth
Number
Size
Shape
Structure
Eruption

Factors associated with developmental disturbances

- Genetics
- Trauma
- Infections
- Radiation
- Chemotherapy
- Endocrine disorders
- Severe intrauterine disturbances

NO. OF TEETH


Number
Anodontia
Supernumerary teeth
Predeciduous Dentition
Postpermanent Dentition

Developmental Alterations in the Number of Teeth

- Anodontia : total lack of tooth development.
- Hypodontia : lack of development of one or or a few teeth missing
- Oligodontia : lack of development of six or more teeth or only a few teeth present

Anodontia

- Congenital absence of teeth
- May be
  1) True
  2) False or induced
  3) Pseudoanodontia

1) TRUE ANODONTIA :

1) Total , 2) Partial

TRUE TOTAL ANODONTIA :

- All teeth missing
- Deciduous or permanent dentition
- Very rare condition
- Associated with Hereditary Ectodermal Dysplasia

Andodontia

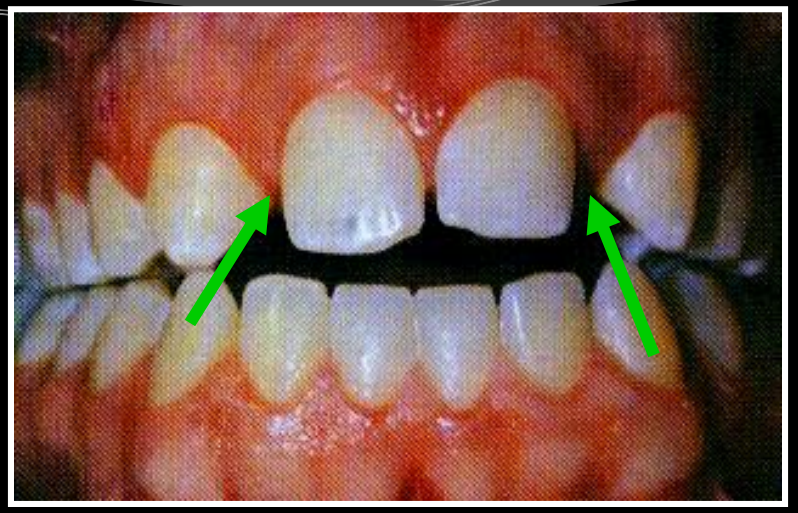
True partial anodontia

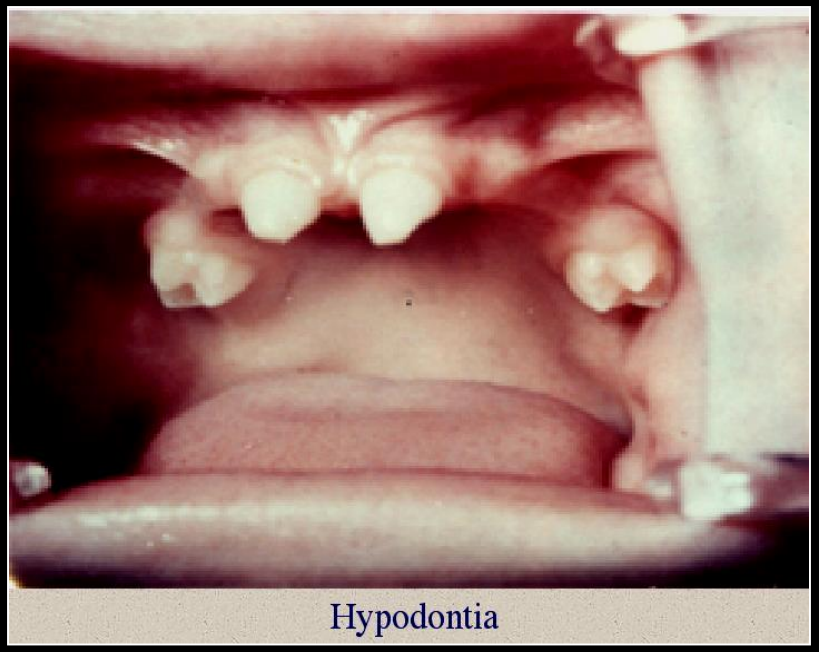
- Common condition
- Any tooth - missing
- Third molars, maxilllary lateral incisor , second premolars
- Deciduous teeth - rarely

  Lateral incisors ,canines

Etiology:

- Extreme sensitivity of tooth bud
- Trauma, infection, chemotherapy, radiation, Endocrine disturbance





Hypodontia

- Associated with Ectodermal dysplasia

2) **False OR Induced anodontia**

- extraction of all teeth

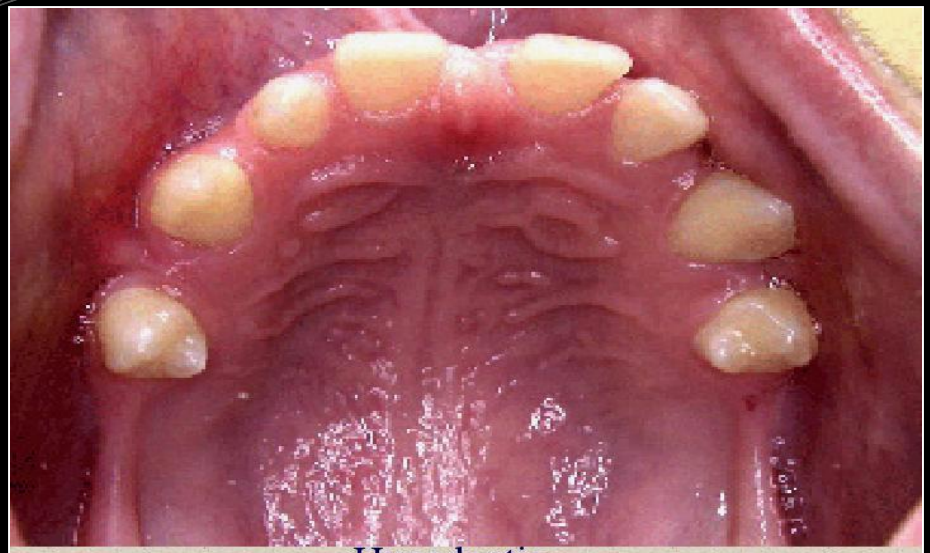
3) **Psuedoanodontia :**

- multiple unerupted teeth
  impacted or embedded teeth

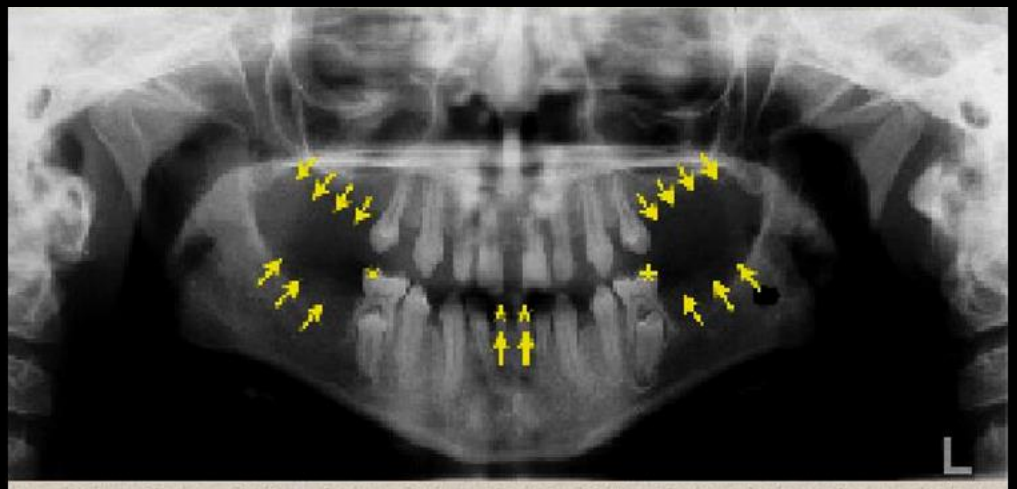
True anodontia : failure of odontogenesis

False or induces anodontia & psuedoanodontia :

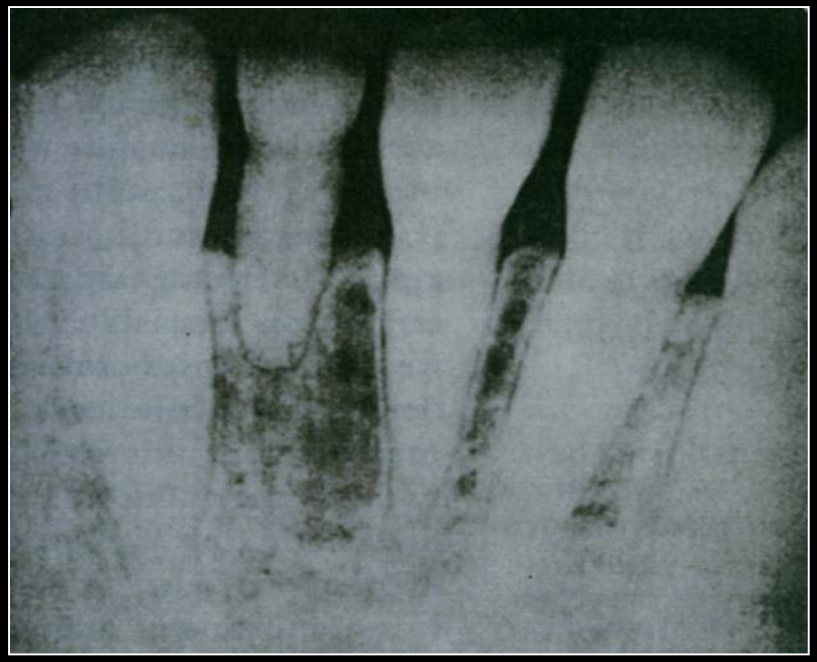
no failure of odontogenesis

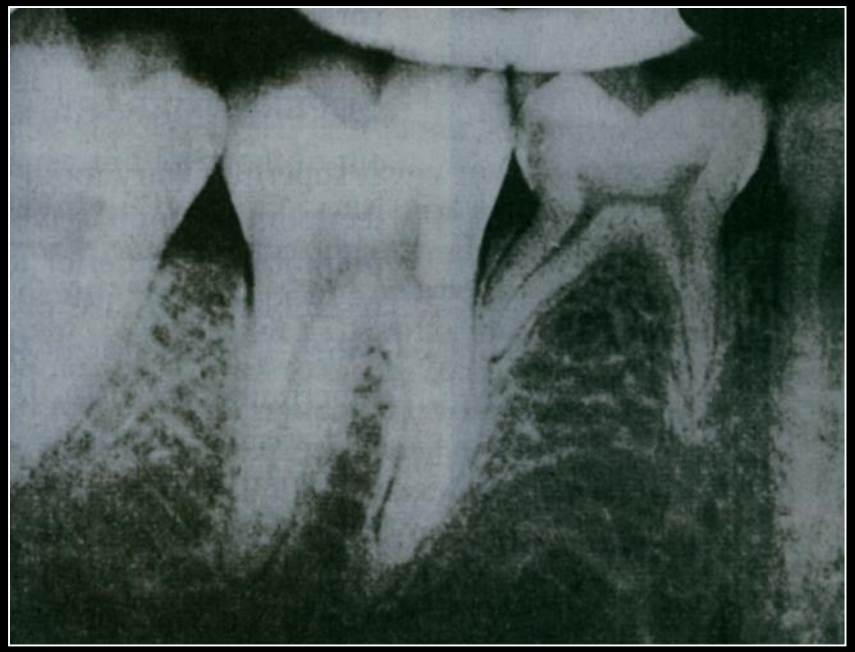


Hypodontia



Hypodontia



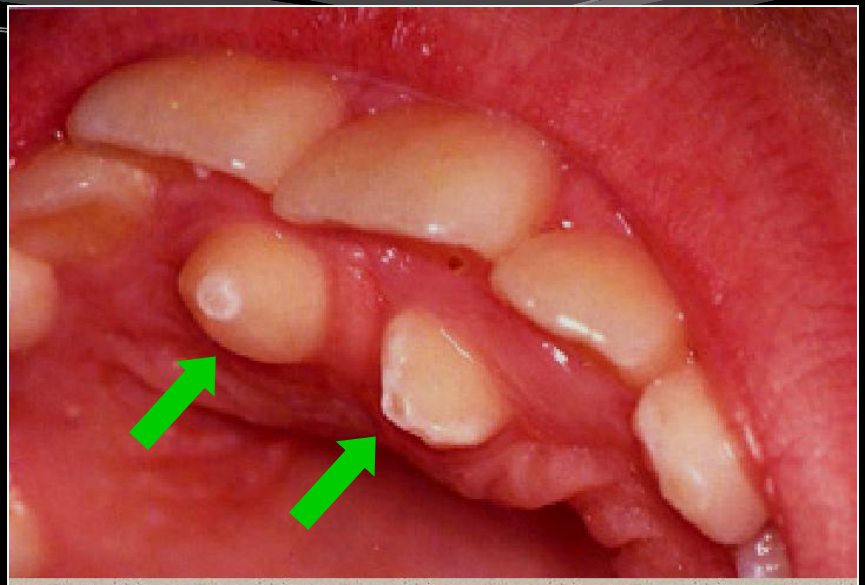


Supernumerary Teeth
Hyperdontia

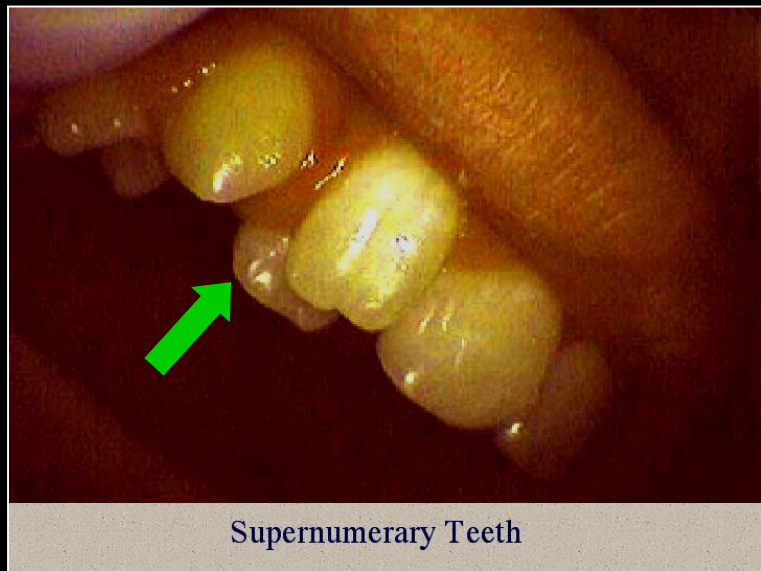
- Presence of extra teeth
- Shape: to which it belong or variety of form i.e. Conical
- 1)From third tooth bud
  2)Splitting of permanent tooth bud
  3)hyperactivity of dental lamina
- Hereditary tendency

C/F :common in permanent than deciduous dentition

- Single or multiple , unilateral or bilateral , erupted , impacted or inverted
- in **CLEFT LIP & PALATE**
  CLEIDOCRANIAL DYSPLASIA
  GARDNER SYNDROME
- May gingiva , maxillary sinus , maxillary tuberosity , soft palate or nasal cavity



Supernumerary Teeth



Supernumerary Teeth

Cleidocranial dysplasia

Supernumerary Teeth

Different morphological types :

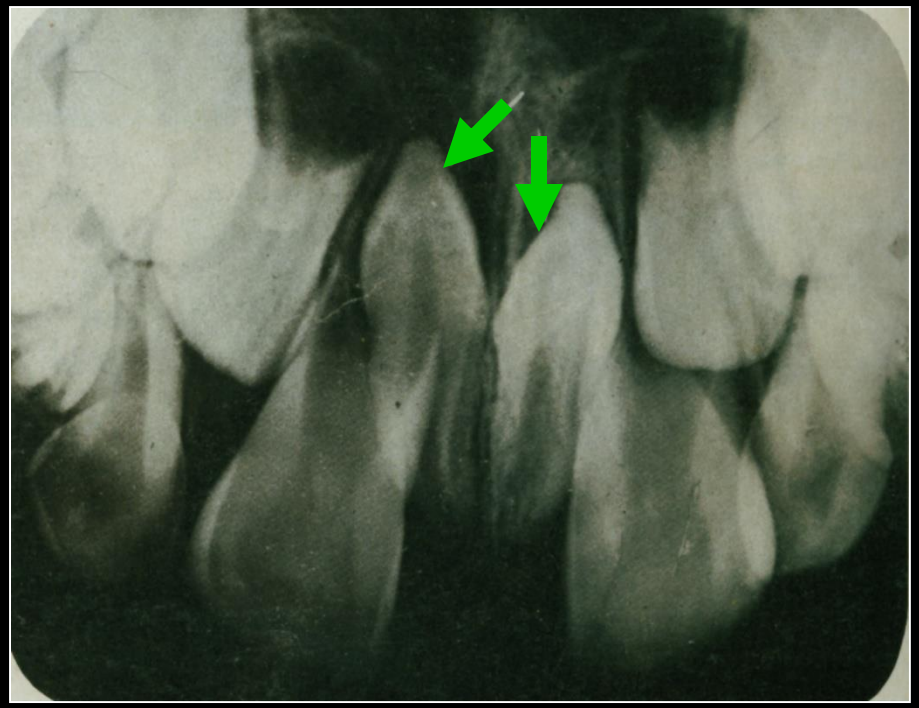
1) Conical : conical shaped
2) Tuberculate : barrel shaped anterior with more than one cusp
3) Supplemental : normal shape
4) Odontome

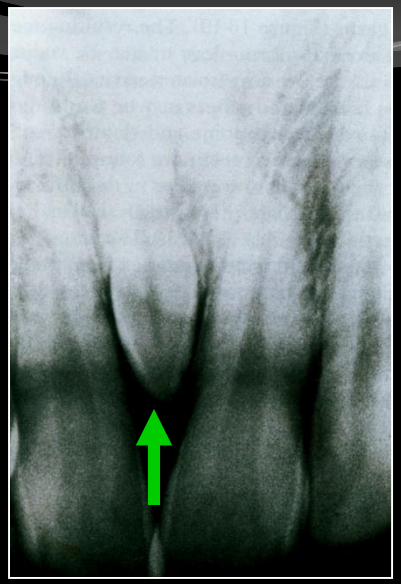
Conical

in both dentition

MESIODENS : between maxillary central incisors

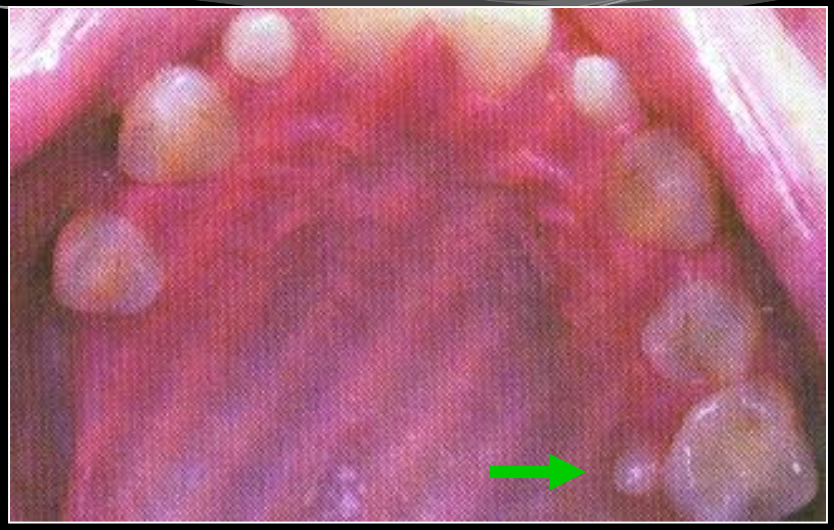
- Single , erupted, impacted , inverted or in horizontal position in palate
- Rotation or displacement of incisors

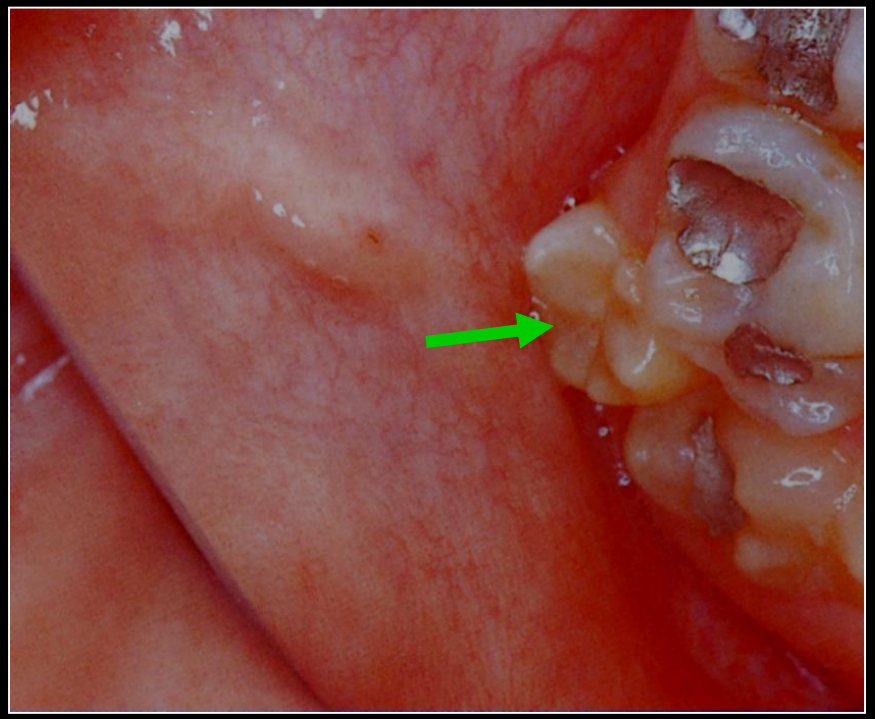




Supernumerary teeth named according to location

i.e. Distomolar , paramolars

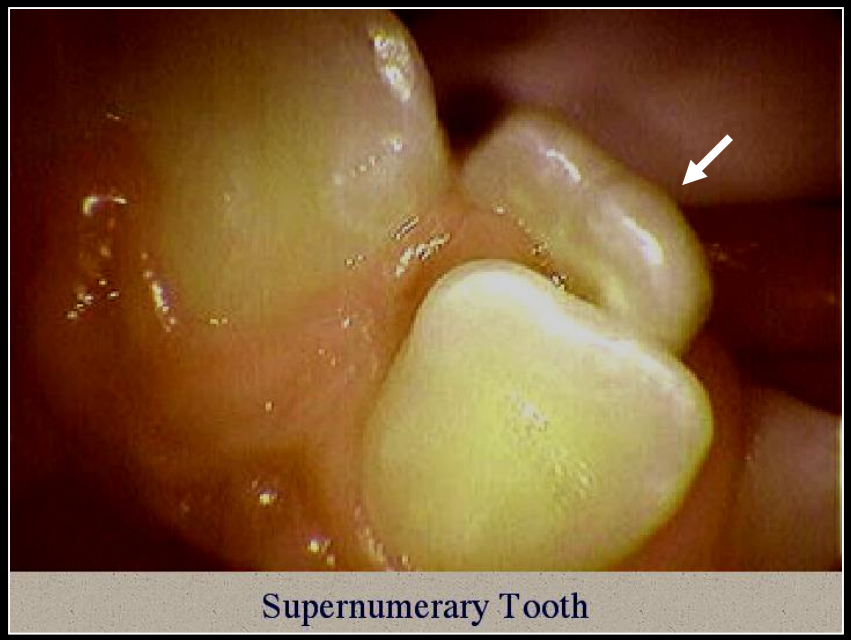




Supplemental:

duplication of teeth in normal series

- Morphology resemble to teeth to which it belong
- Common with premolars



Supernumerary Tooth

Predeciduous dentition

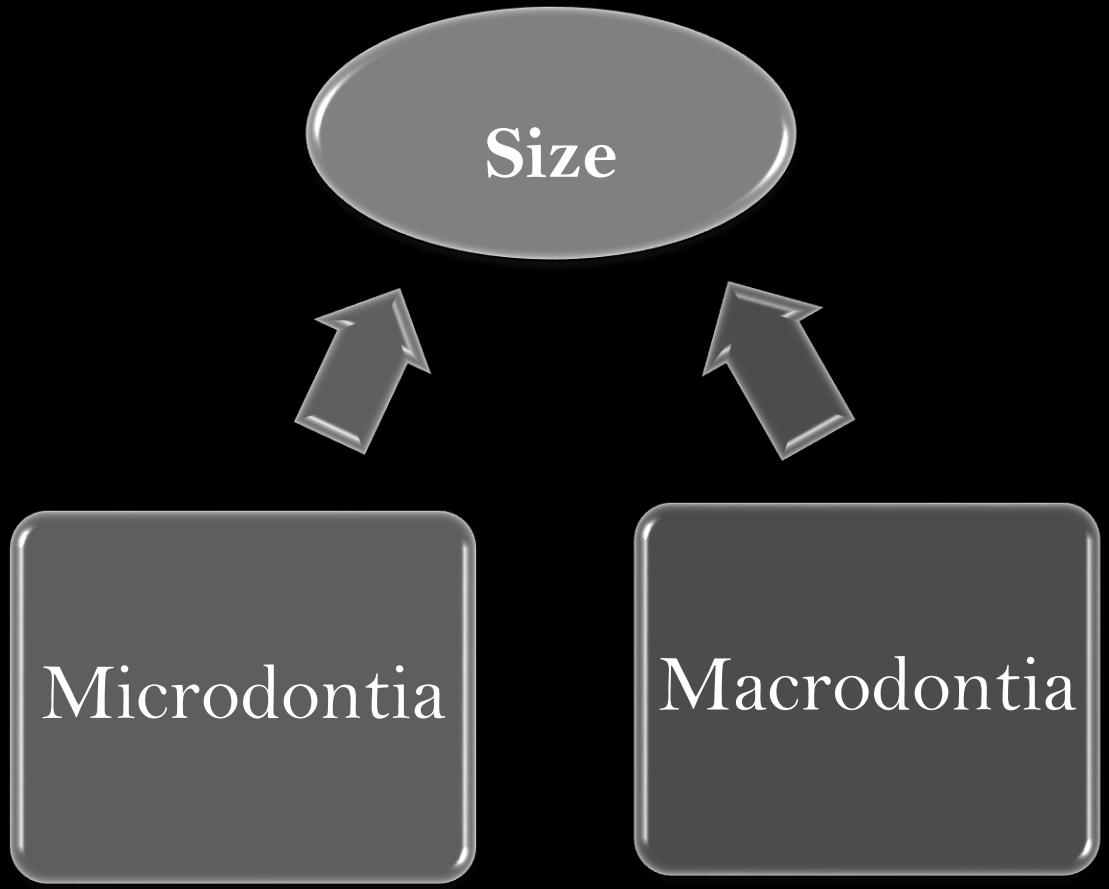
- Infants born with structures which appear to be erupted teeth
- Hornified structure without root, over gingiva
- Easily removed
- Either from accessory bud of dental lamina or from bud of accessory lamina
- Should be differentiated from natal teeth
- Represent dental lamina cyst of newborn

Postpermanent dentition

- Erupt after extraction of all permanent teeth
- After insertion of complete denture
- Embedded or impacted teeth
- **Embedded : not erupted because of lack of eruptive force**
- **Impacted teeth: not erupted because of physical barrier in eruption path**

Impacted tooth

Size of teeth


Size
Microdontia
Macrodontia

Microdontia

- one or more teeth smaller than normal
- **THREE TYPES :**
  - **1) True generalised microdontia**
  - **2) Relative generalised microdontia**
  - **3) Single tooth**

1)True generalised microdontia

- all teeth in both arches –smaller
- extremely rare
- Pituitary dwarfism, Down syndrome
- teeth well formed , smaller in size

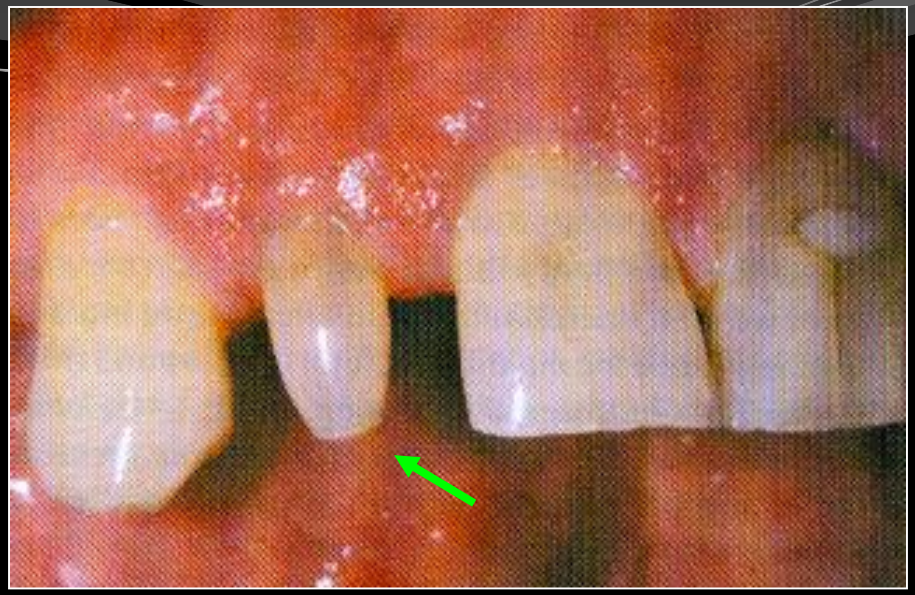
2) Relative generalised microdontia :

- normal or slightly smaller teeth present in larger jaws (macrognathia)

Microdontia

3) Single tooth :

- more common condition
- maxillary lateral incisor , third molars , supernumerary teeth
- common form - maxillary lateral incisor ***"peg lateral"***
- mesial & distal surfaces converge or taper incisally
- cone or peg shaped crown
- root – very short
- Mesio - distal dimension reduced



Macrodontia (Megalodontia)

- Opposite to microdontia
- Teeth larger than normal
- **Three types :**

1) True generalised macrodontia

2) Relative generalised macrodontia

3) Single tooth

Rhizomegaly

- **(Radiculomegaly): uncommon type of macrodontia**
- **Root or roots longer than normal**
- **Commonly seen maxillary canine**

1) True generalised macrodontia :

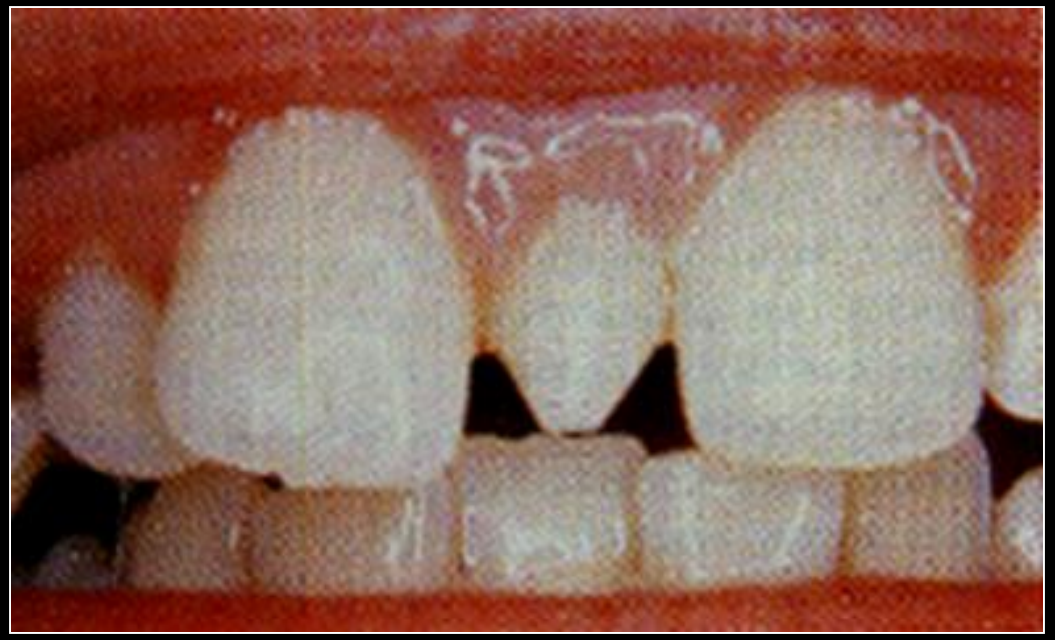
- Extremely rare condition
- All teeth larger than normal
- **Pituitary gigantisn**

2) Relative generalised macrodontia :

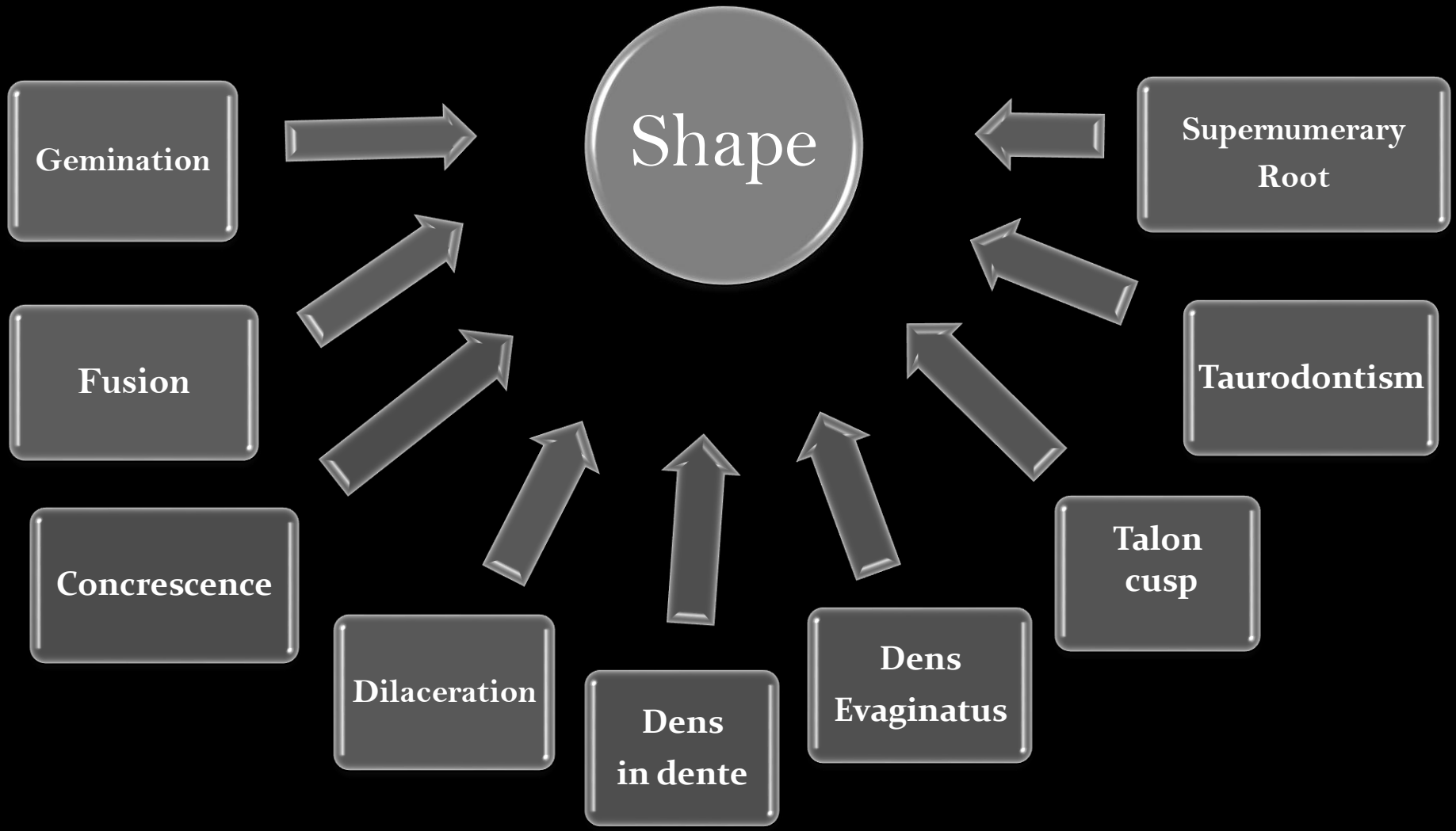
- More common
- Presence of normal or slightly larger teeth in relatively small jaws : micrognathia
- Illusion of macrodontia

3) Single tooth :

- Uncommon
- Tooth - normal except size
- Sometimes seen in facial hemihypertrophy

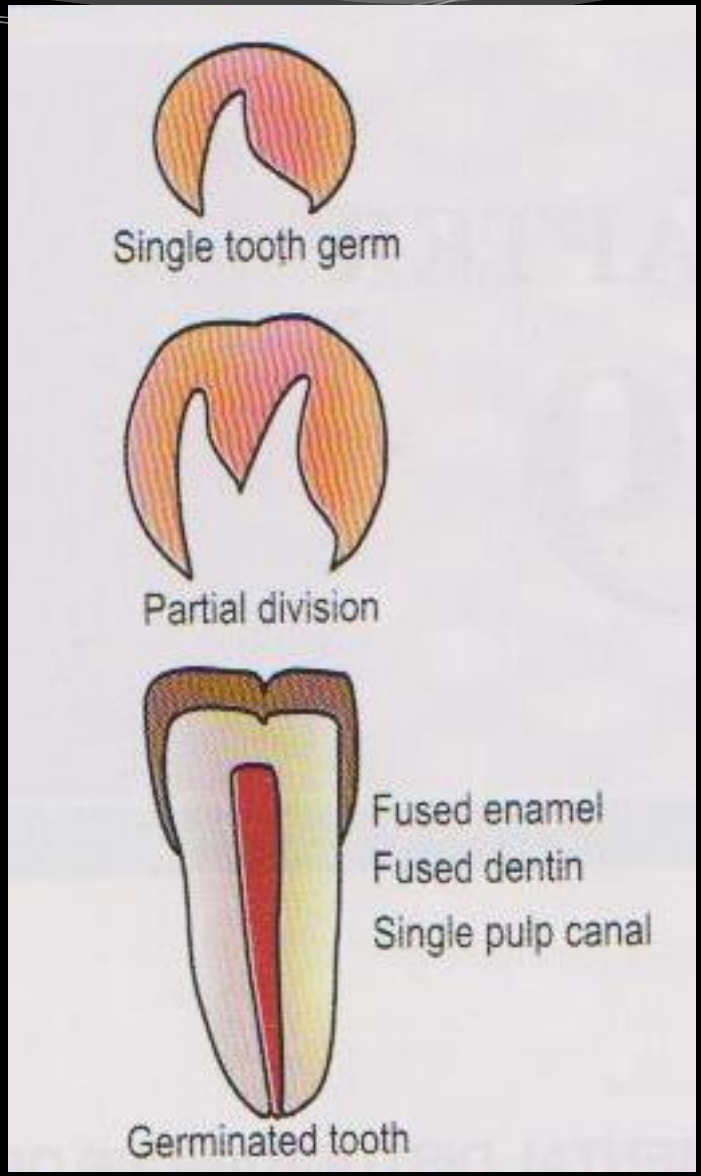


SHAPE OF TEETH


Shape
Gemination
Fusion
Concrescence
Dilaceration
Dens in dente
Dens Evaginatus
Talon cusp
Taurodontism
Supernumerary Root

Gemination

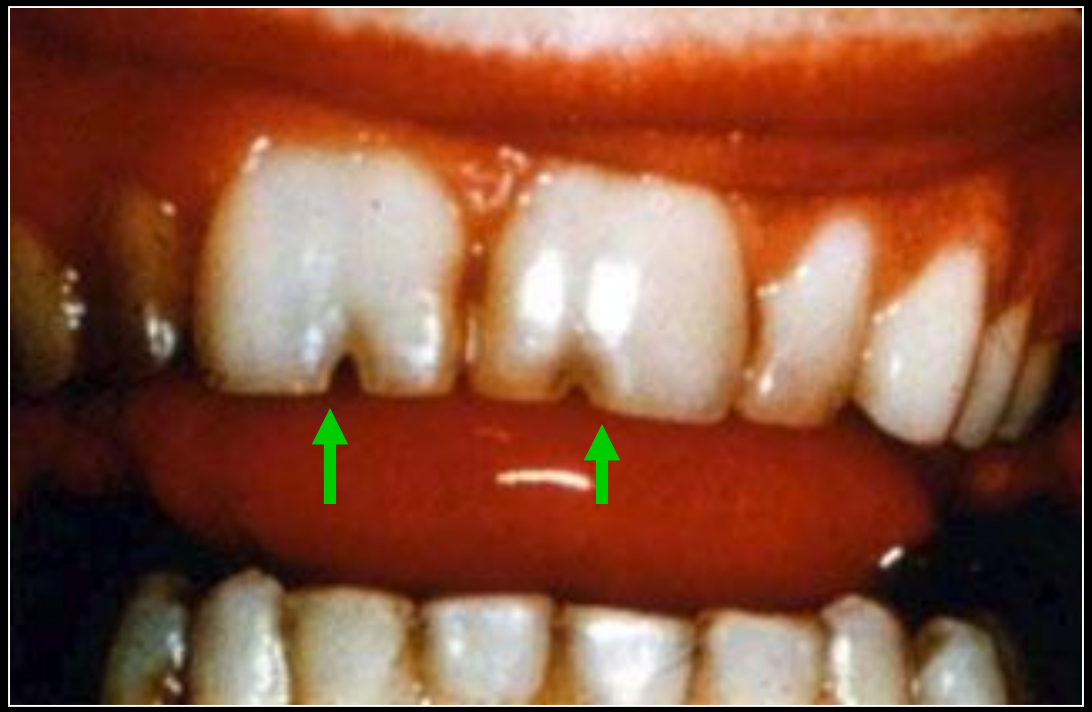
- Due to division of single tooth germ by invagination :incomplete formation of two teeth
- Formation of two completely or incompletely separated crown & single root & root canal



Gemination

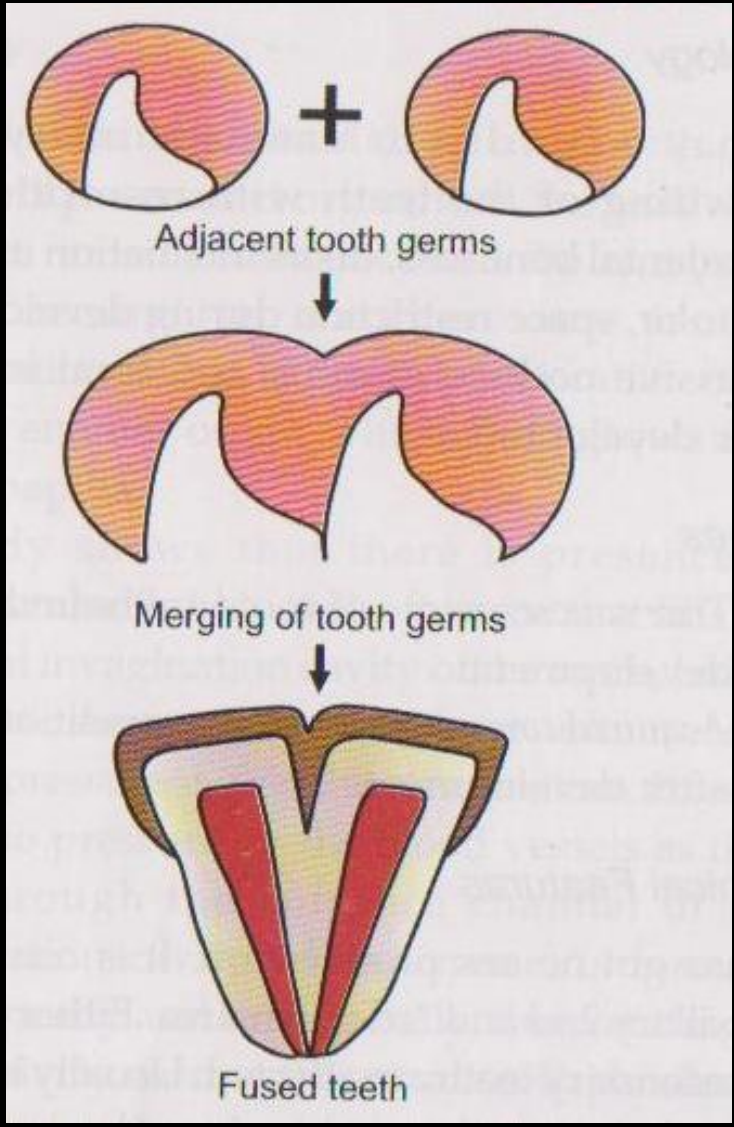
C/F :

- As an indentation or groove separating two crown or extremely widen crown
- Seen in both dentition
- **"Twinning" :** production of equivalent structures by division resulting in one normal & one supernumerary tooth



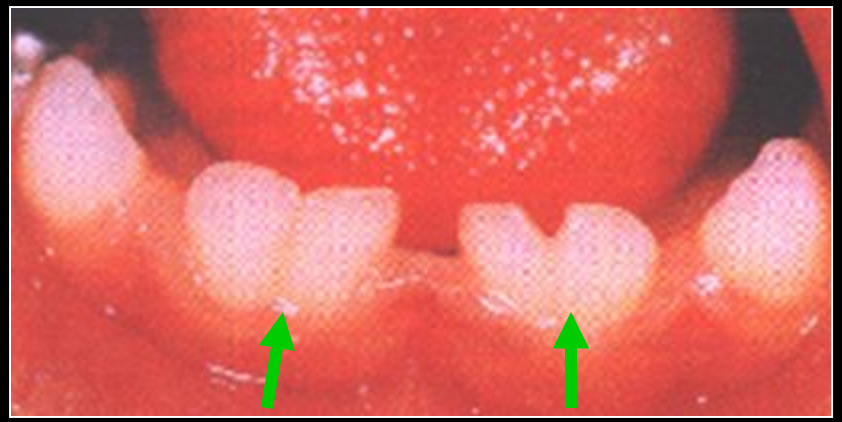
Fusion

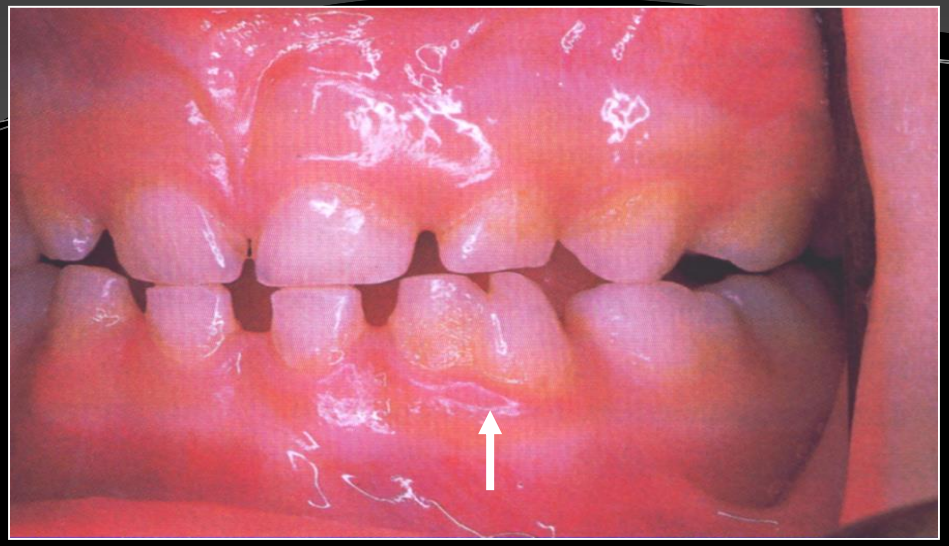
- union of two separated tooth germs
- complete or partial , depending upon stage of development of tooth at the time of union



Fusion

- Physical force or pressure
- Contact before calcification : complete union , later crown completed : union of roots only
- Dentin always confluent
- Both dentition
- Between supernumerary & permanent teeth
- Problems : appearance , spacing , periodontal





Deciduous dentition

Fusion

Gemination & fusion

Fusion

Gemination

Concrescence

- After root formation is completed
- United by cementum only
- Crowding of teeth or traumatic injury
- **TWO TYPES –**

  Developmental

  Postinflammatory

Developmental concrescence :

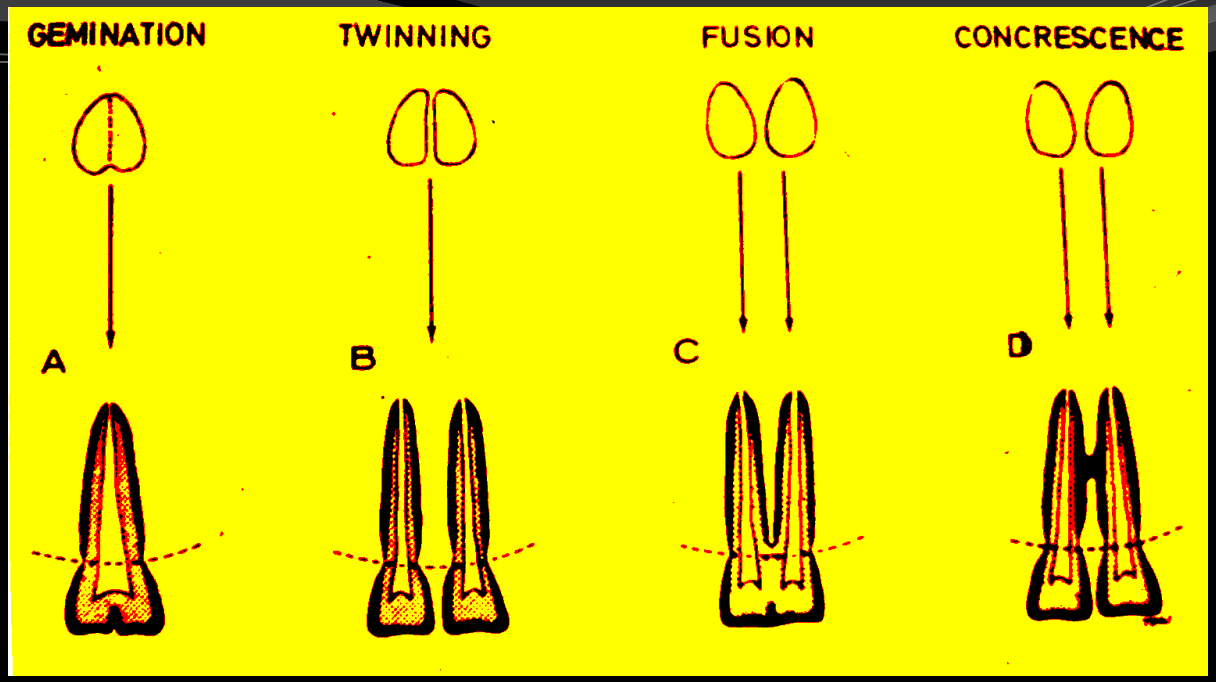
- Because of lack of space or misplacement of tooth germ
- Seen in maxillary 2nd & 3rd molars

Developmental concrescence

Post-inflammatory :

- Due to chronic infection or trauma
- Inflammation of intervening structure
- Resorption of interdental bone
- With resolution , new cementum deposited until united
- Diagnosis – radiographic examination
- Difficulties in extraction

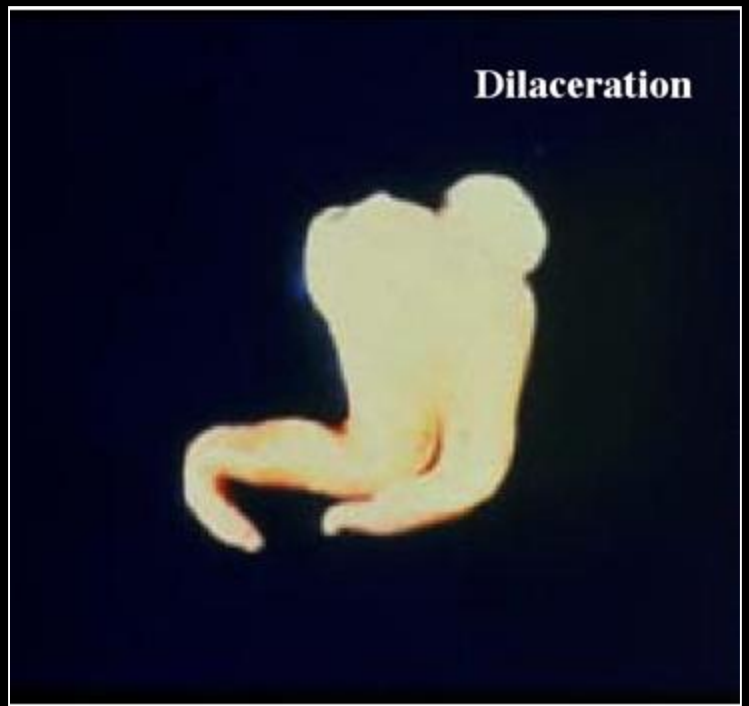
Differences



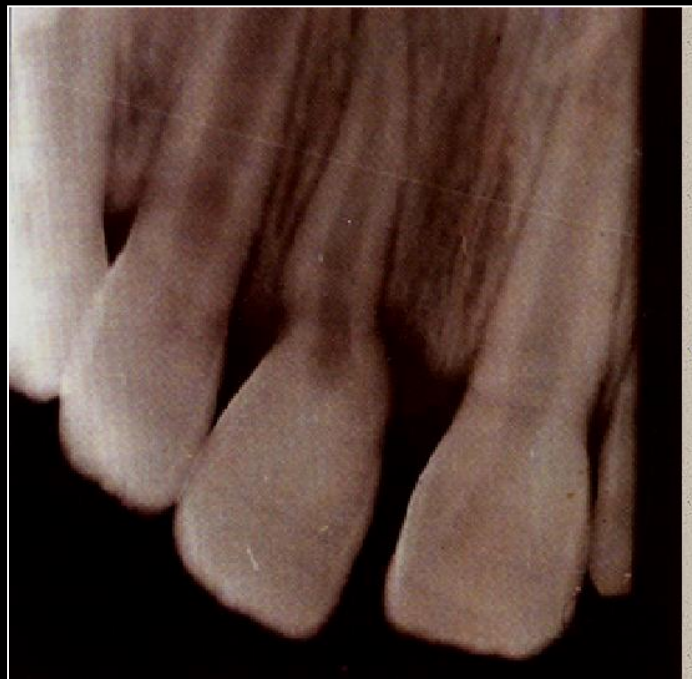
Gemination (schizodontia, twinning)	Fusion (synodontia)	Concrescence
One bud	Two buds	Two teeth
Division	Union	Union
During deve.	During deve.	Postdevelopmental
One canal	Dentin union	Cementum union

Dilaceration

- Abnormal bend or curve or angulation in root
- Due to trauma during formation of tooth
- Secondary to presence of cyst, tumor or odontoma
- Anywhere along length of root
- May be in cervical, middle or apical third
- Difficulties in extraction

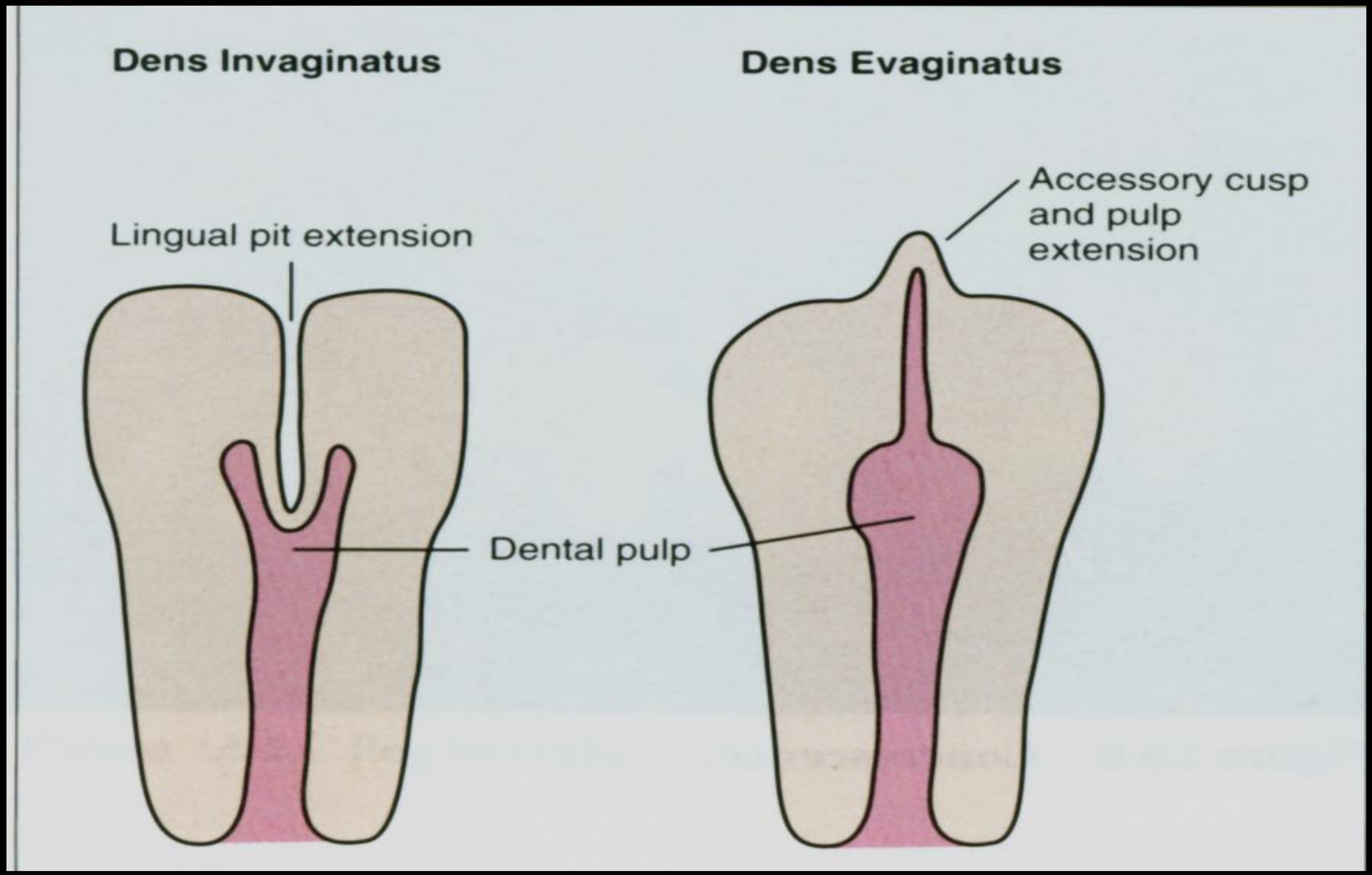


Dilaceration



Dilaceration

Dens Invaginatus & Dens Evaginatus

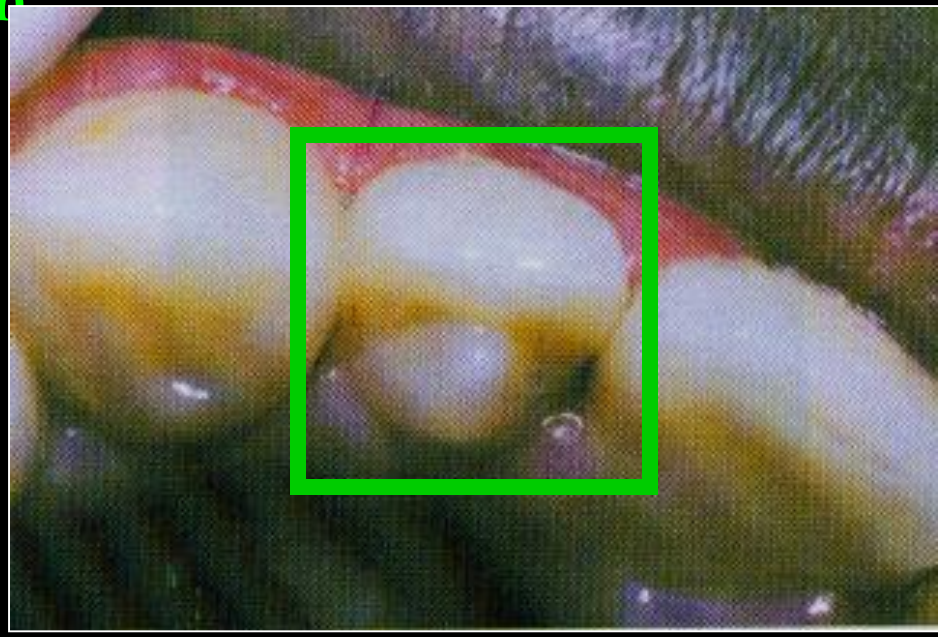


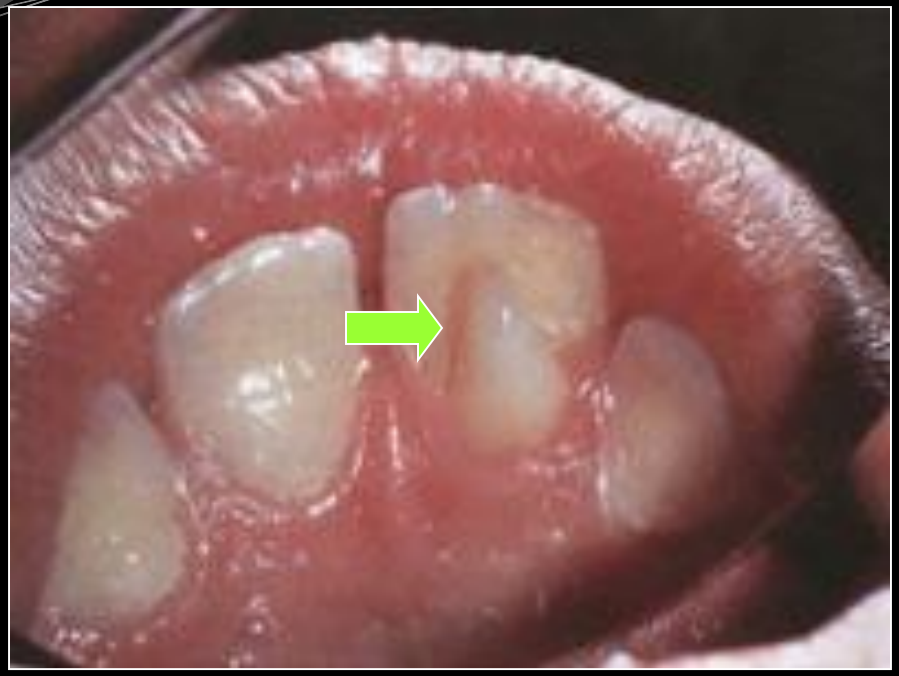
Talon cusp
Dens evaginatus in anterior tooth

- Additional cusp located on lingual surface of anterior tooth resembling eagle's talon
- Extends half of distance from CEJ to incisal edge
- Common in maxillary anterior teeth
- Rarely in deciduous teeth

C/f : blends smoothly with tooth

- Presence of developmental groove
- Composed of enamel dentin & horn of pulp tissue

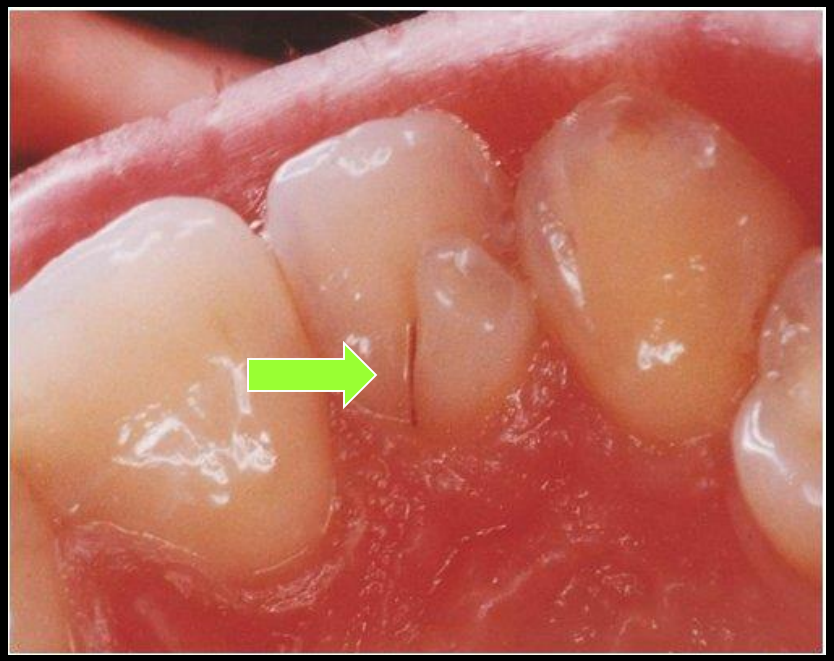




periodontal problem , caries , occlusal accommodation , displacement

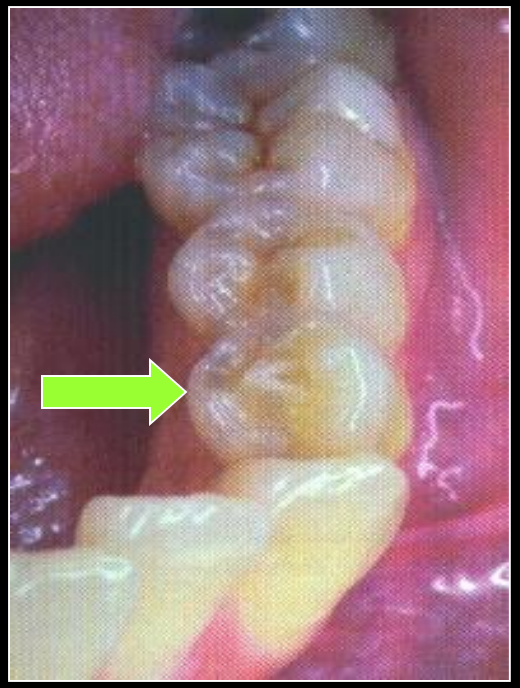
More prevalent in

Rubinstein – Taybi syndrome



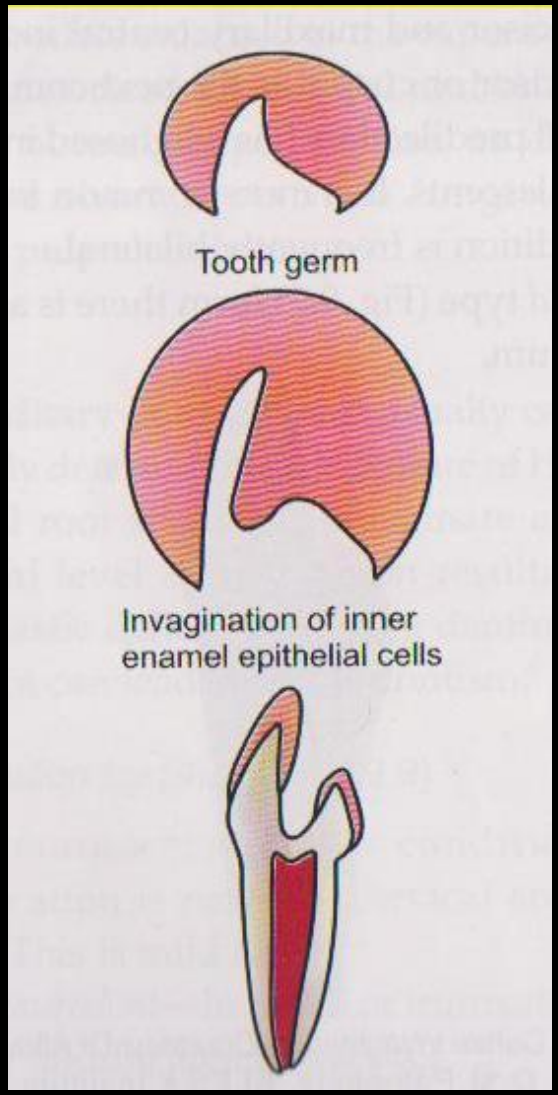
Dens evaginatus
Occlusal enamel pearl , Central tubercle

- An accessory cusp or globule between buccal & lingual cusp of premolars
- Unilaterally or bilaterally
- Consist of enamel , dentin & pulp
- Occlusal problems & prone to fracture resulting pulpal exposure



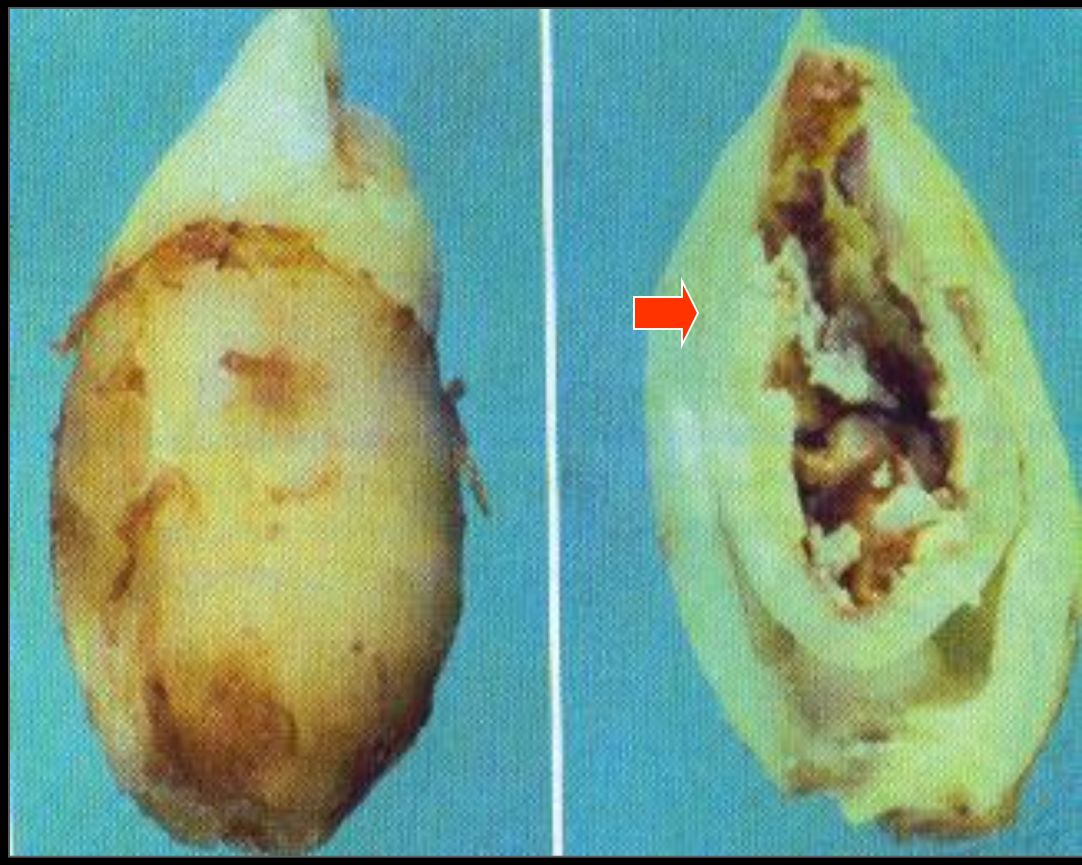
Dens Invaginatus (DENS IN DENTE)

- Arise due to invagination in surface of crown before calcification
- Invagination lined by enamel.
- Invagination : vary in extension
- As accentuated lingual pit to deep invagination
- Severe : deep invagination extending upto apex : **Dense in dente**



C/F :

- Permanent maxillary lateral incisor commonly affected, may affect central incisor canine , premolars
- accentuated lingual pit to deep infolding of extending to apex
- Invagination may be large & resemble tooth with tooth – Dens in dente



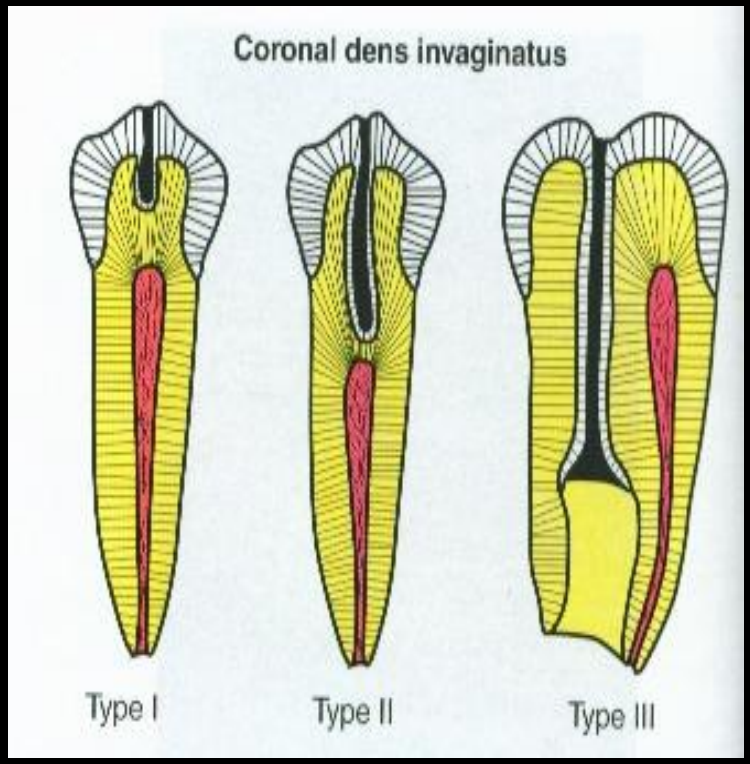
DENS INVAGINATUS

Three major types :

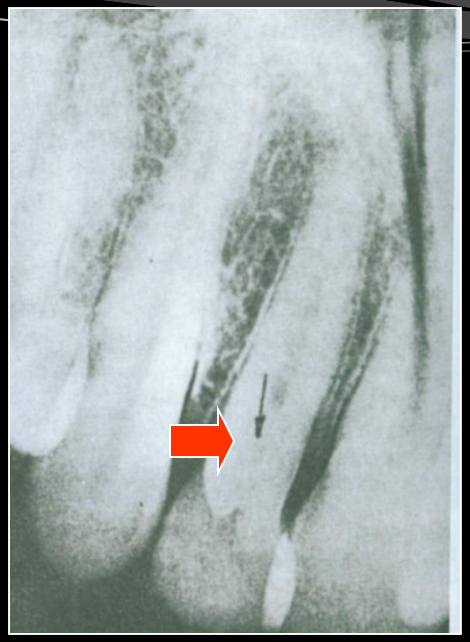
Type –I : invagination confined to crown

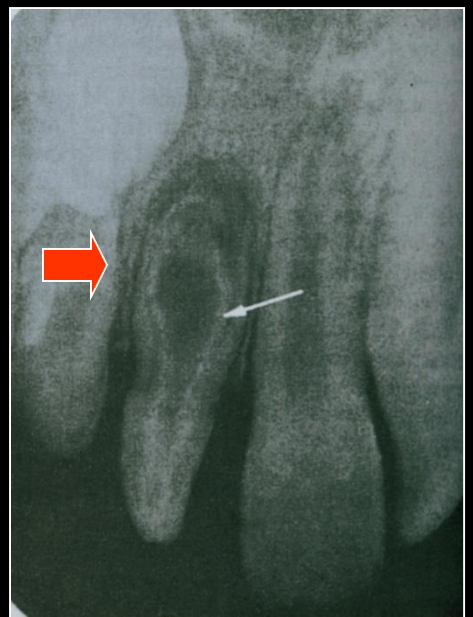
Type –II: extends below CEJ may or may not communicate with pulp

Type –III: extend in root , perforates apical or lateral radicular area without communication with pulp



Radiographically : pear shaped invagination of enamel & dentin with narrow constricted opening on surface





Difference between Gemination & Dense in dente

- no attempt for division of tooth germ
- Invaginated portion lined by enamel in dense invagnatus

Taurodontism

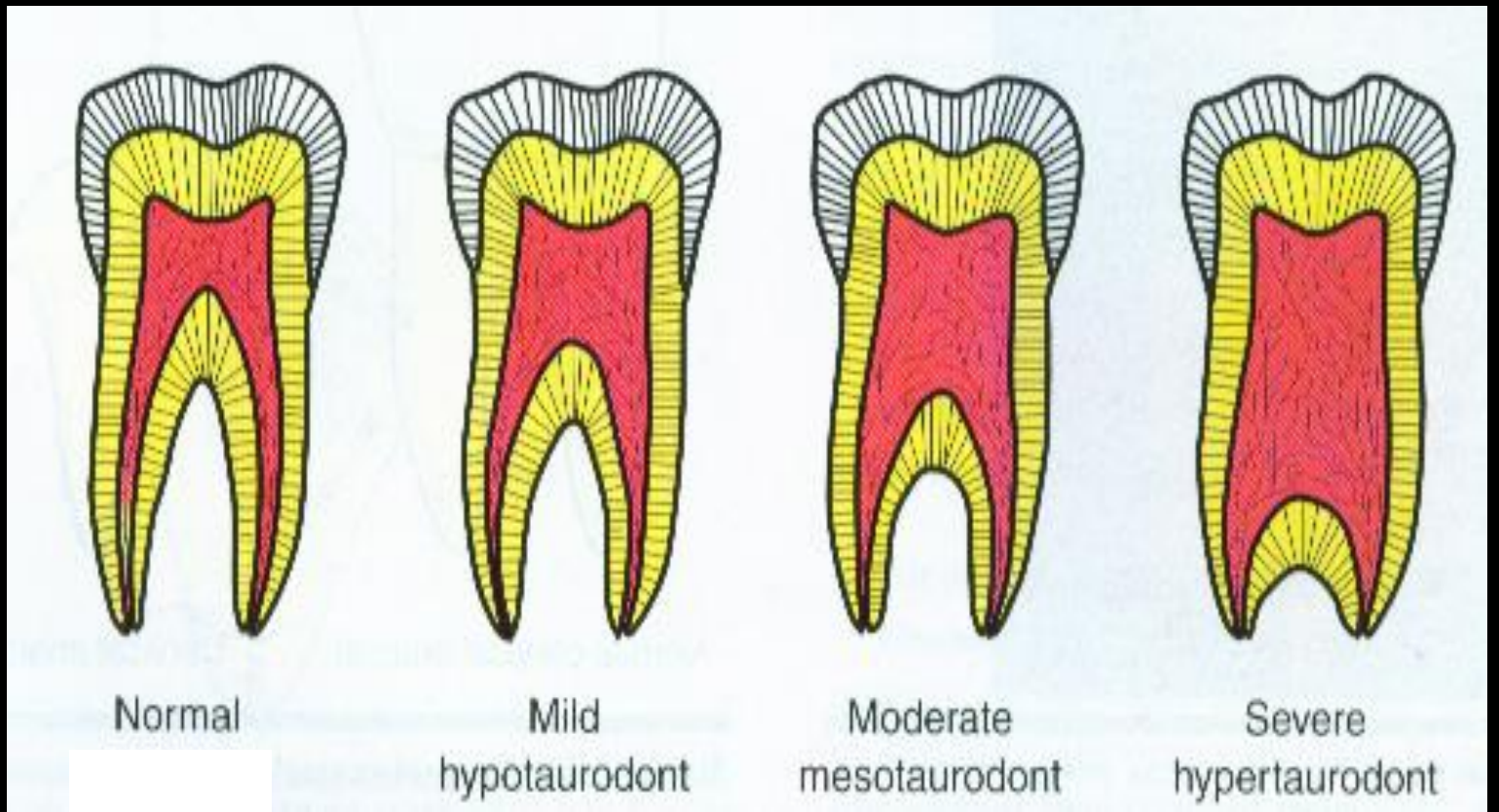
- Body of tooth enlarged at expense of roots
- Shape resembles to molar of cud chewing animals **(tauro – bull)**

C/F: both dentitions

- Molars most commonly
- Single or several molars
- Unilateral or bilateral
- No clinical features
- Diagnosis : x- ray

Classified :Depending upon apical displacement of pulpal floor

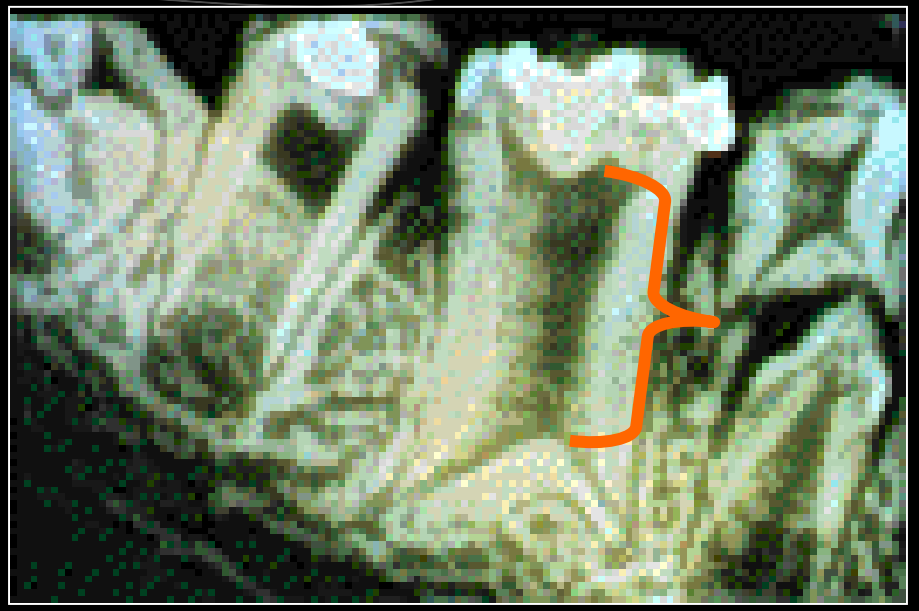
- Mild (hypotaurodont)
- Moderate (mesotaurodont)
- Severe (hypertaurodont)

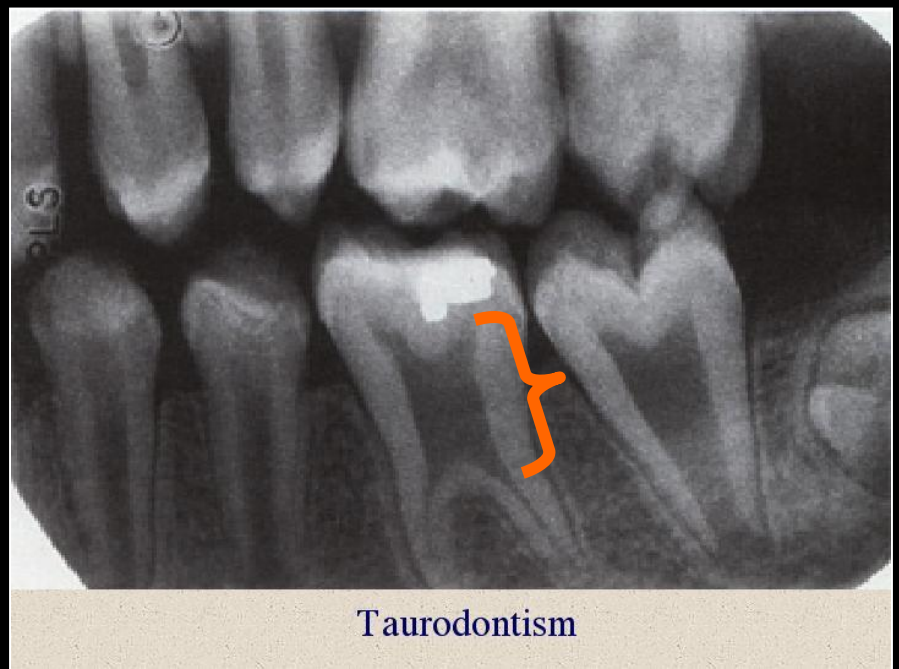


Taurodontism

X-ray : rectangular in shape

- Pulp chamber extremely large
- Greater occluso-apical height
- Lacks of usual constriction in cervical region
- Root extremely short
- Bifurcation or trifurcation in apical area





Taurodontism

Supernumerary roots

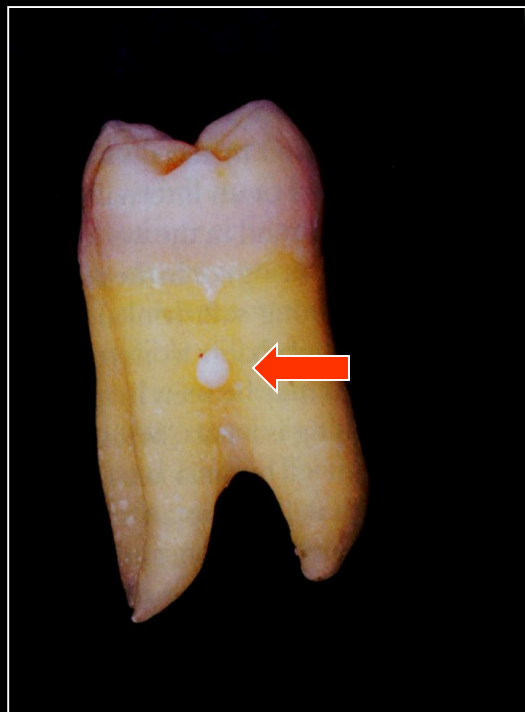
- Very common condition
- Involve any tooth
- Presence of extra root
- Siingle rooted i.e. Mandibular cuspid & bicuspids – two roots
- Maxillary & mandibular third molars – one or more extra roots
- Additional root –very small , divergent or superimposed over other root

Clinical significance

- in endodontic therapy & exodontia
- RCT – failure
- source of infection
- X-ray examination

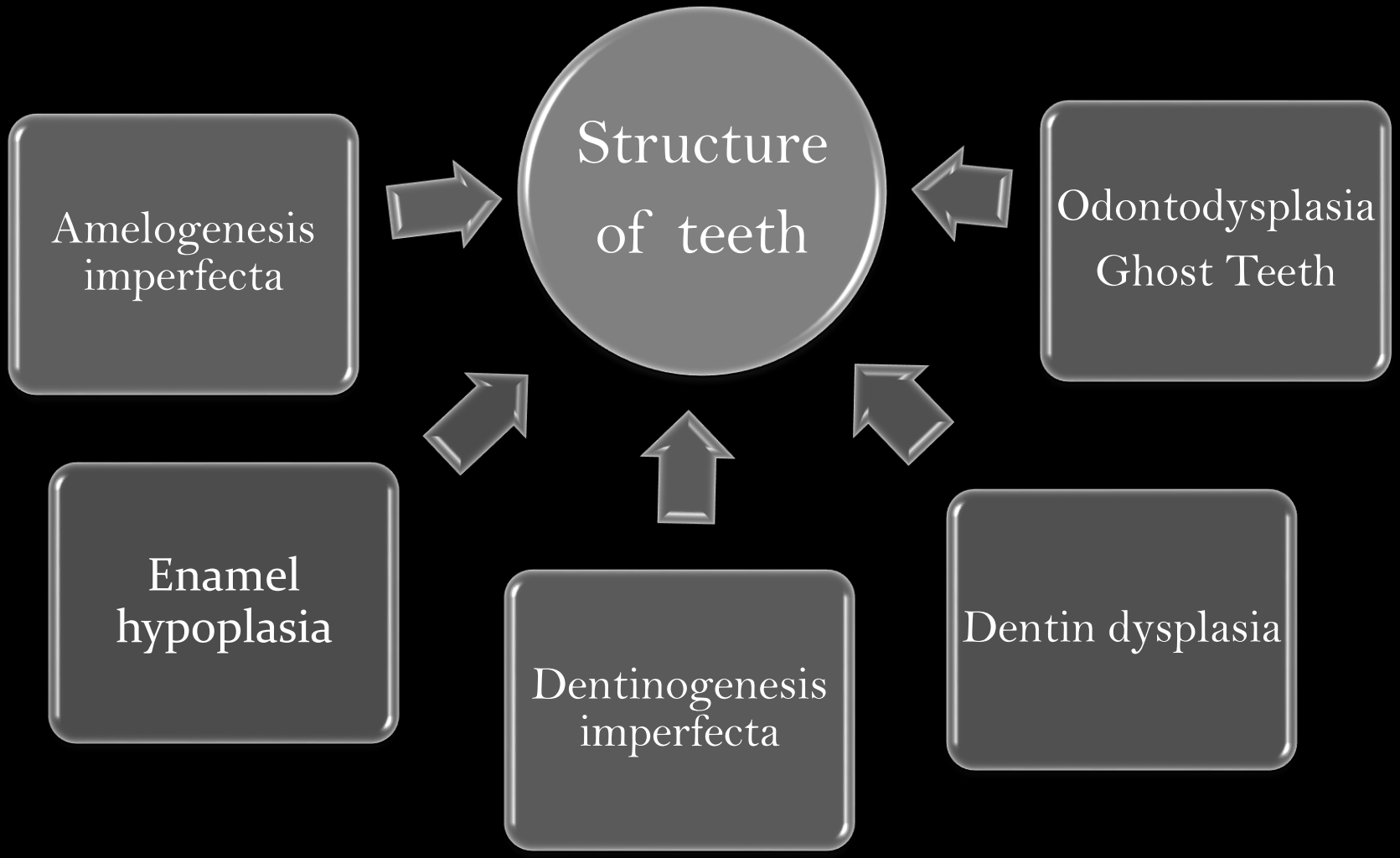
Enamel pearl (Ectopic enamel)

- Presence of enamel in unusual location mainly root portion called enamel pearl
- Small focal, excessive mass of enamel on surface
- At bifurcation or trifurcation of tooth near CEJ
- core of dentin & thin strand of pulp extending from root canal
- Might arise from misplaced group of ameloblasts




EP
CEJ

Structure of teeth


Structure of teeth
Amelogenesis imperfecta
Odontodysplasia Ghost Teeth
Enamel hypoplasia
Dentinogenesis imperfecta
Dentin dysplasia

Enamel hypoplasia

- Definition : incomplete or defective formation of organic enamel matrix
- Two types :
  1) **Hereditory type:**
     (Amelogenesis imperfecta)
  2) **caused by environmental factors**
- Hereditory type : (AI)
  - Affect both dentition
  - Only enamel affected
- Environmental type :
  - either dentition or single tooth
  - both enamel & dentin affected at least to some degree

Amelogenesis imperfecta

- Hereditory
- Both dentitions & all teeth affected
- Only enamel affected

Enamel hypoplasia

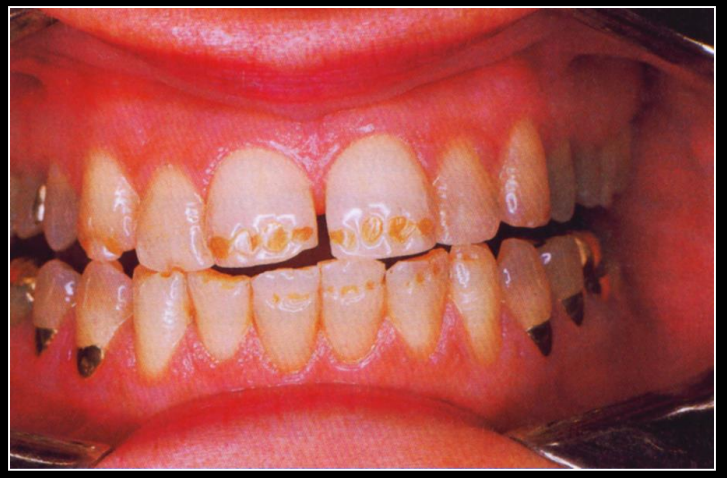
- Environmental cause
- Either dentition or single tooth affected
- Enamel as well as to some extent dentin also affected

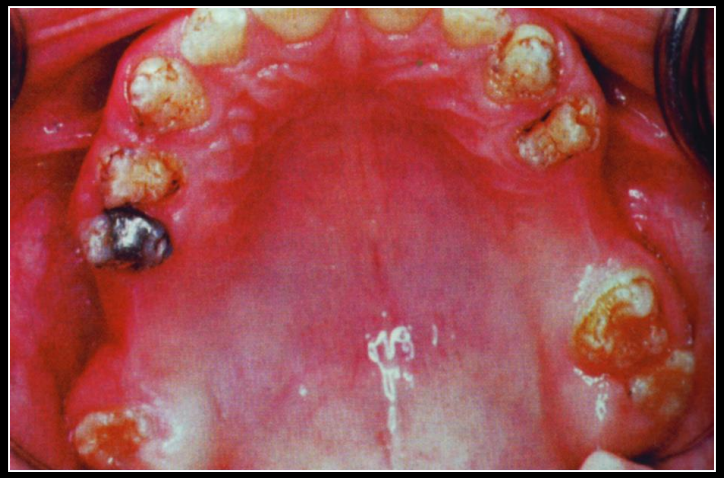
Enamel hypoplasia (Environmental)

- Ameloblasts extremely sensitive to External stimuli
- injury during formative stage –hypoplasia
- Not possible after calcification completed
- Factors :
  - Nutritional deficiency (vit A,C, D)
  - Exanthomatous diseases (measles , chickenpox ,scarlet fever)
  - Birth injury
  - Congenital syphilis
  - Local infection or trauma
  - Ingestion chemicals (fluoride)

C/F :

- Mild form – few pits
- Severe form – rows of deep pits horizontally across surface
- Most severe case – considerable portion absent





Enamel hypoplasia

1) Nutrition deficiency :

- Rickets ,deficiency of vit. A , C,
- Pitting variety

2) Exanthomatous fever :

- Measles , chickenpox , scarlet fever
- Pitting varirty
- Staining of pits – unsightly appearance

congenital syphilis

- Not pitting variety
- Characteristic & pathognomic features
- Anterior teeth --"Hutchinson's incisors"
- Molars -"Mulberry molars" (Moon's molar)

Hutchinson's incisors :

- Upper central incisors –"screw – driver" shaped
- Mesial & distal surfaces converge
- Incisal edge notched
- Cause of tapering & notching – absence of central tubercle or calcification center

Mulberry molar

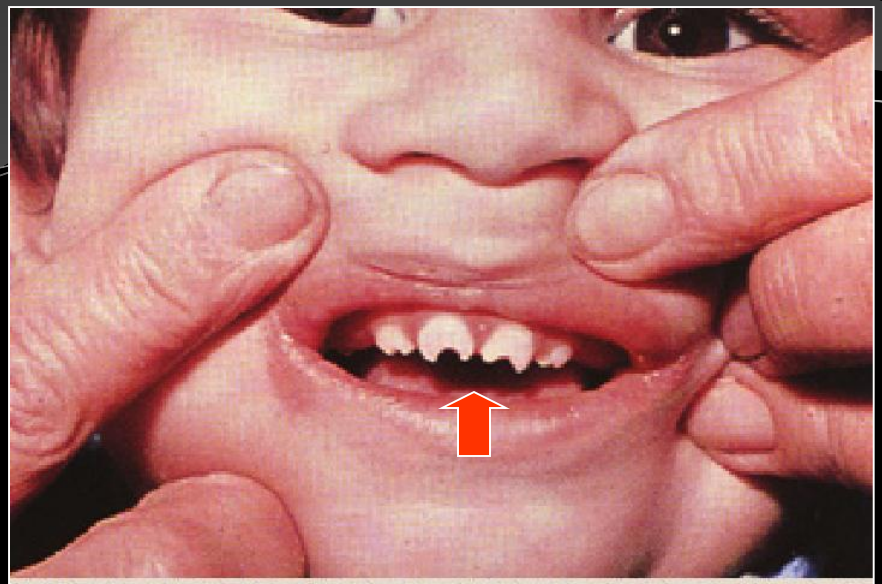
- Crown of first molar irregular
- Agglomerate mass of globules rather than well formed cusps
- Narrow occlusal surface

HUTCHINSON'S TRIAD :

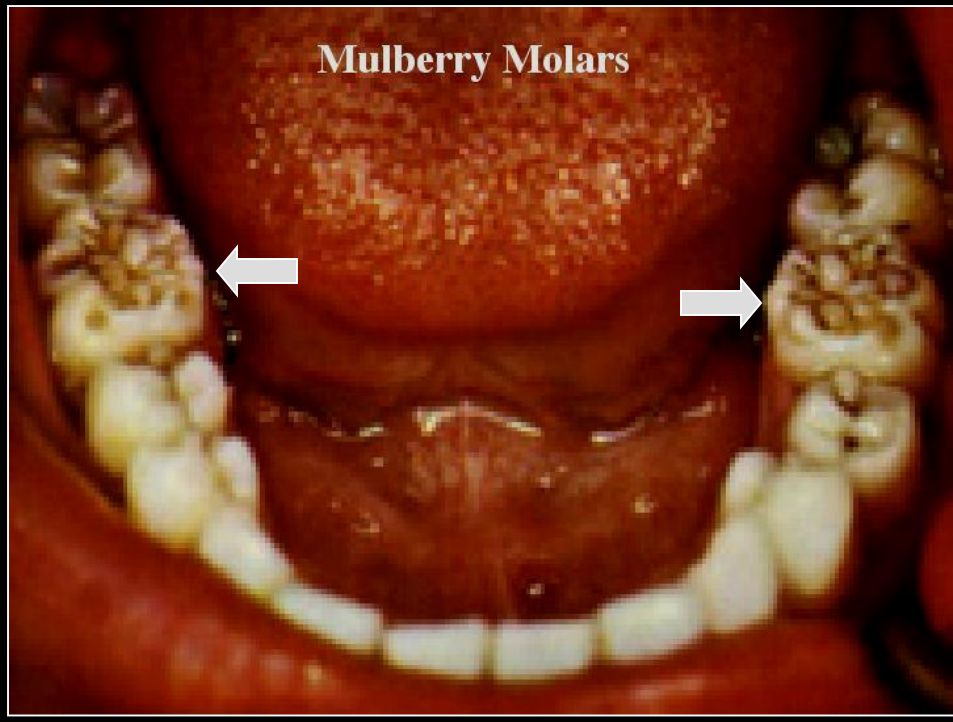
1) **Hutchinson's teeth**
2) **Eight nerve deafness**
3) **Interstitial keratitis**

Hutchinson's incisors

Mulberry molar



Hutchinson's Incisors



Turner's hypoplasia

- Due to local infection or trauma
- Only single tooth involved
- Maxillary incisors , maxillary or mandibular premolars
- mild brownish discoloration to severe pitting & irregularity
- Teeth called: **TURNER'S TEETH**
- Condition called : **TURNER'S HYPOPLASIA**

carious deciduous teeth –– periapical infection – disturb functions of ameloblasts – hypoplastic crown

- Severity depends upon –

  severity of infection & stage of Tooth formation

Trauma to deciduous tooth – driven into socket – disturb permanent tooth bud

- Menifestated as yellowish or brownish pigmentation or as pitting or deformity

Fluorosis

- Ingestion of excess amount of fluoride
- Etiology : ingestion of fluoride containing drinking water during tooth formation
- Severity increases with increasing amount of fluoride
- progressively evident above 1 ppm of water

C/F : wide range of severity depending upon level of fluoride in water

1) Questionable : occational white flacks or spots

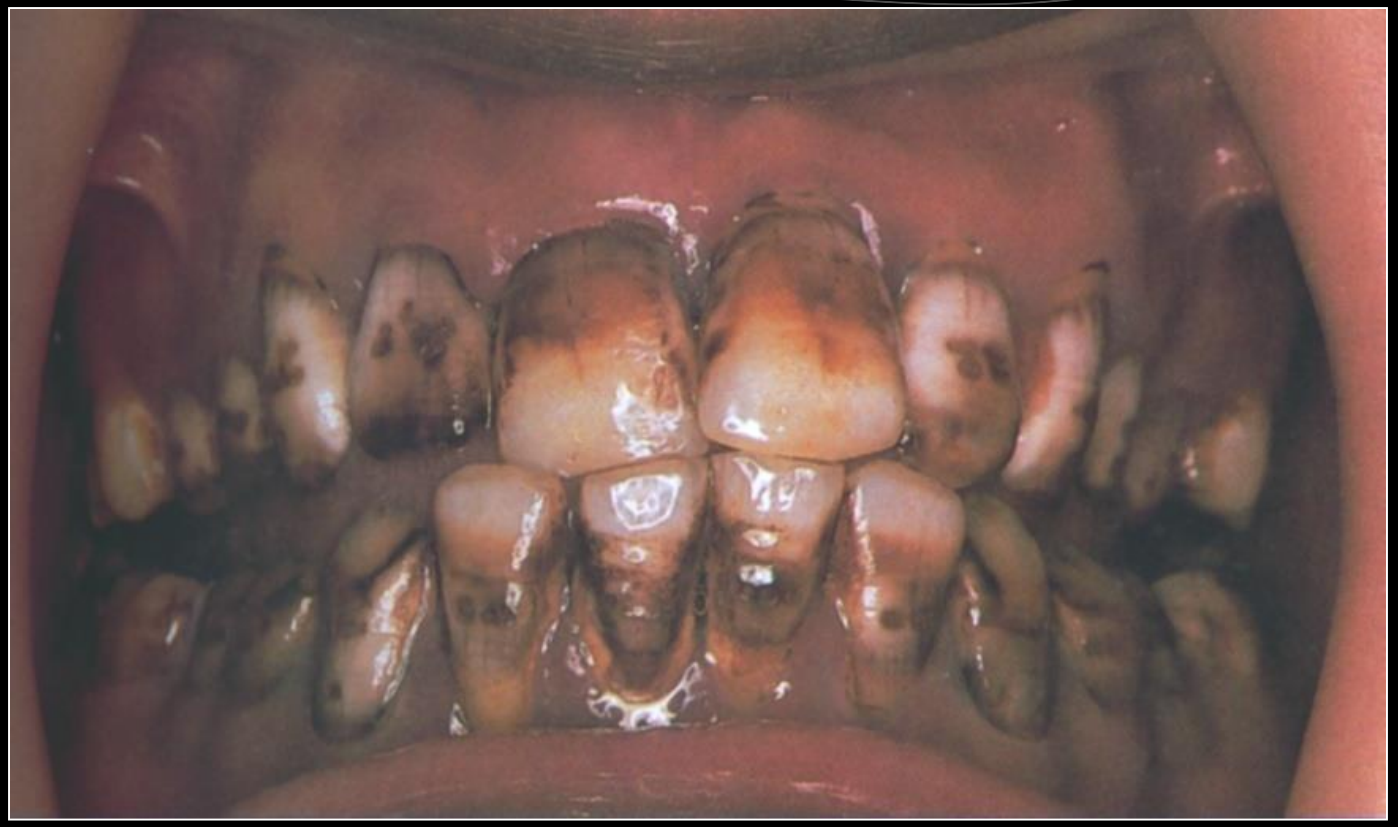
2) Mild : white opaque area involving more surface

3) Moderate & severe : pitting & brownish staining

4) Corroded appearance

Affected teeth are caries resistant

Severe condition



Fluorosis causes increased pitting & porosity because fluoride increases retention of amelogenin which results in hypomineralised enamel . This causes An unasthetic chalky white or brownish appearance of enamel

Enamel is more resistant to caries .

Amelogenesis imperfecta (Hereditary enamel hypoplasia ,Hereditary brown enamel)

- Hereditary disorder of enamel
- Both dentition
- Only ectodermal portion affected i.e. Enamel
- 14 types of A.I. deteced
- Genes : AMELX (amelogenin)
  ENAM (enamelin)
  MMP-20 (enamelysin)
  KLK4 (Kallikrin -4)
  AMBN (ameloblastin)

Three types

- Depending upon stages of amelogenesis
  1) Organic matrix formation → hypoplastic
  2) Calcification → hypocalcified
  3) Maturation → hypomaturation

Hypoplastic type

Hypocalcified type

Dusturbance in calcification.
Normal thickness but soft
Easily lost.

Hypomaturation type

Disturbance in maturation Thickness normal but less hard & less translucency Pierce with tip under pressure,Chipping of enamel

Slide 65: hypoplastic amelogenesis imperfecta

Slide 64: hypocalcified amelogenesis imperfecta

Slide 66: amelogenesis imperfecta hypomaturation type

DENTINOGENESIS IMPERFECTA

Hereditory opalscent dentin

- Autosomal dominant
- Both dentitions
- Only mesodermal portion i.e. Dentin affected
- Enamel normal
- Mutation in **Dentin sialophosphoprotein (DSPP)**

DENTINOGENESIS IMPERFECTA

Classification

Shield's classification (previous classification)

Revised classification

- Type – I : D.I. with osteogenesis imperfecta
- Type – II : D.I. without O.I. (Shield type II)
- Type – II:Brandywine type (Shield type III)
  - Type – III : Brandywine type

Dentinogenesis imperfecta – I (SHIELD'S TYPE – II)
Hereditory Opalscent dentin, D.I. without O.I.,

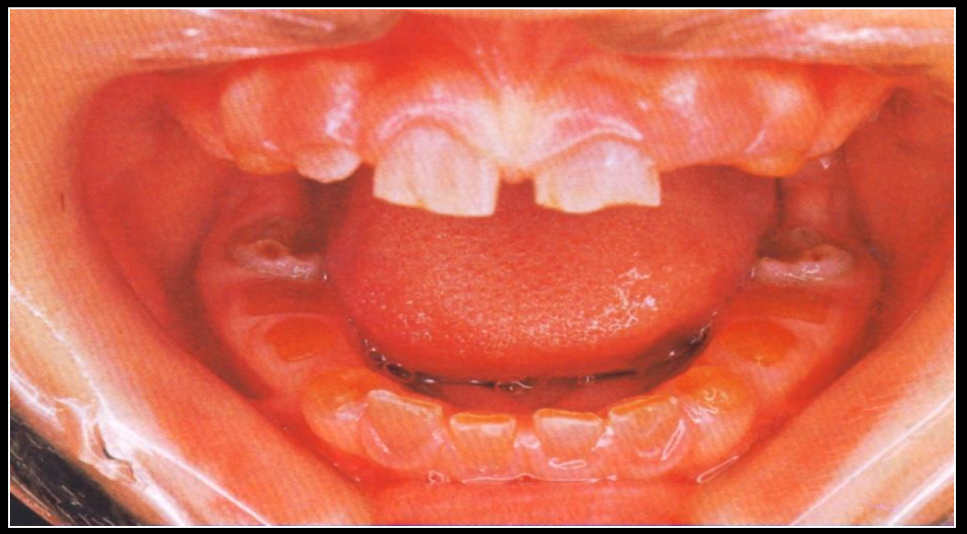
- Only teeth affected , bone pathology absent

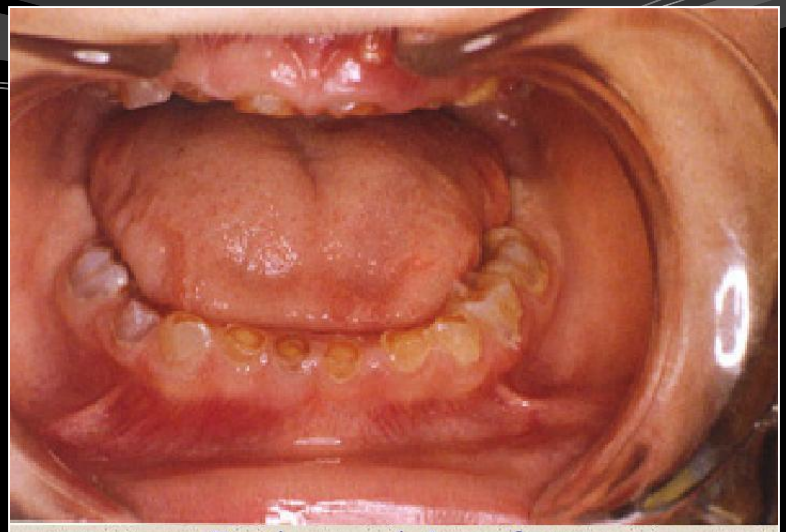
C/F:

- bulbous crown , constriction in cervical area – **TULIP SHAPE**
- Color – yellowish brown, or brownish
- Unusual translucency or opalscent
- Loss of enamel prematurely
- Dentin – severe attrition
- Occlusal surface flattened

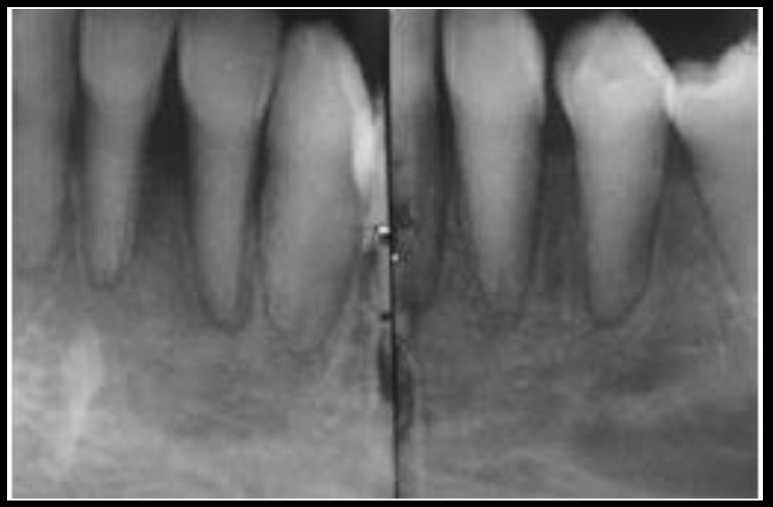
X-ray : complete or partial obliteration of pulp chamber & root canal

- Roots – short & blunt





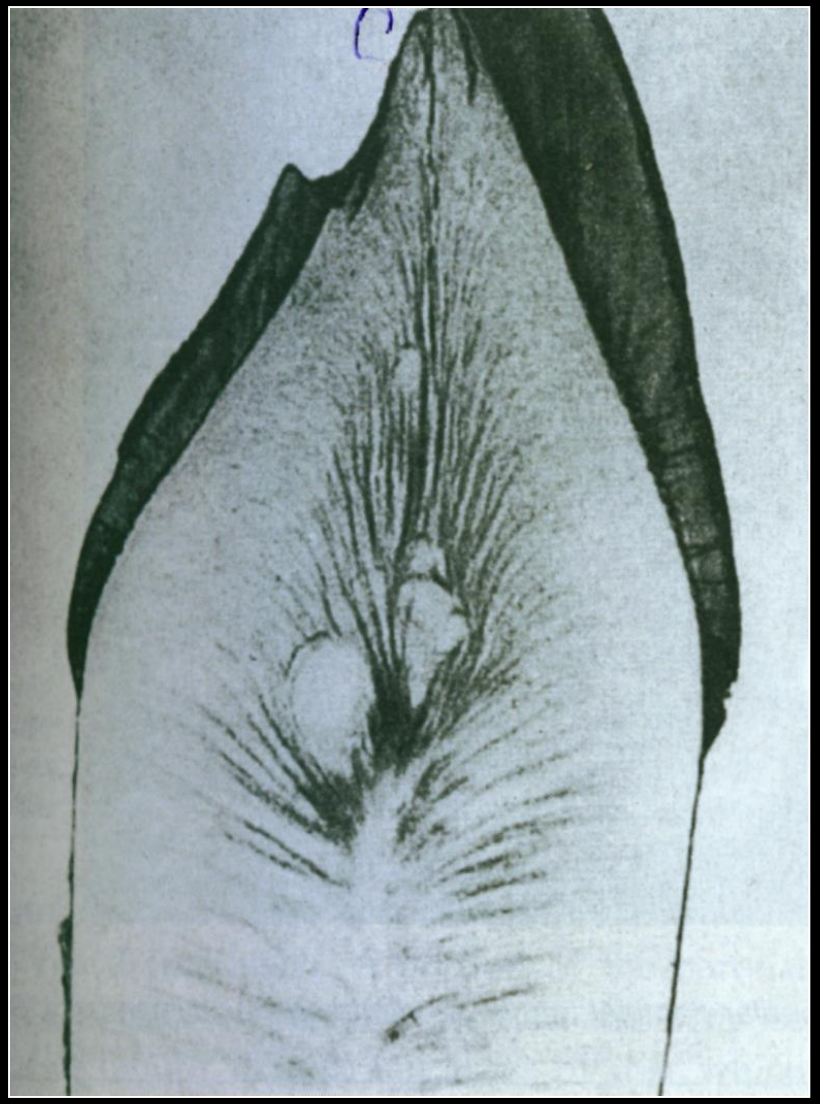
Dentinogenesis Imperfecta



Dentinogenesis imperfecta – I

H/F:

- enamel – normal
- Dentin – irregular tubules , large uncalcified areas
- Tubules – larger , less in no.
- Some areas – complete absence of tubules
- Continued deposition of dentin



Dentinogenesis imperfecta – II

Brandywine type D.I.

SHIELD'S TYPE - III

- Brandywine racial isolated in MARYLAND

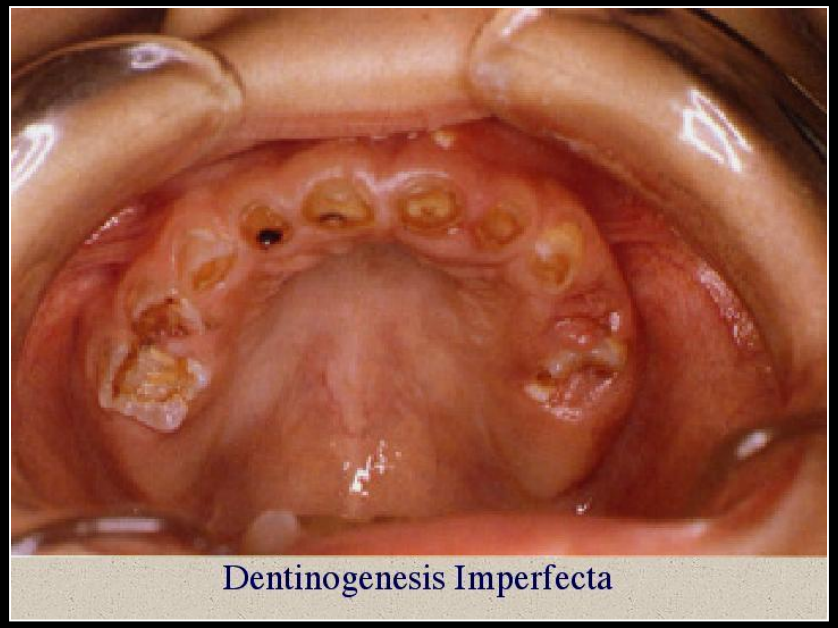
C/F:

- Same as D.I. – I
- Crown of teeth wear rapidly after eruption
- Multiple pulp exposure
- Dentin- amber & smooth

X-ray :

- SHELL teeth
- Enamel normal
- Dentin – extremely thin
- Pulp chambers – large
- roots – short

H/F: not documented



Dentinogenesis Imperfecta

SHELL TEETH

Dentinogenesis imperfecta - I

Dentinogenesis imperfecta - II

Dentin dysplasia (ROOTLESS TEETH)

- Rare hereditary disturbance of dentin
- Enamel normal but atypical dentin formation with abnormal pulp morphology
- No correlation with systemic disease or dentinogenesis Imperfecta
- **Two types**
  - **Type 1- Radicular dentin dysplasia**
  - **Type 2- Coronal dentin dysplasia**
- Type 1 more common

TYPE – I Radicular dentin dysplasia

C/F: both dentition

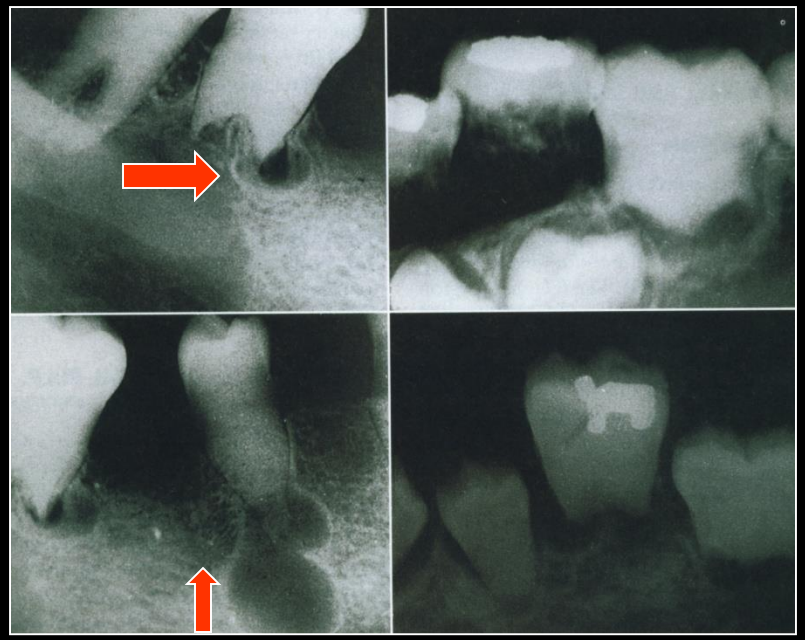
- Clinically appear normal with normal eruption
- Characteristically exhibit extreme mobility & exfoliate prematurely
- Short root

TYPE – I Radicular dentin dysplasia

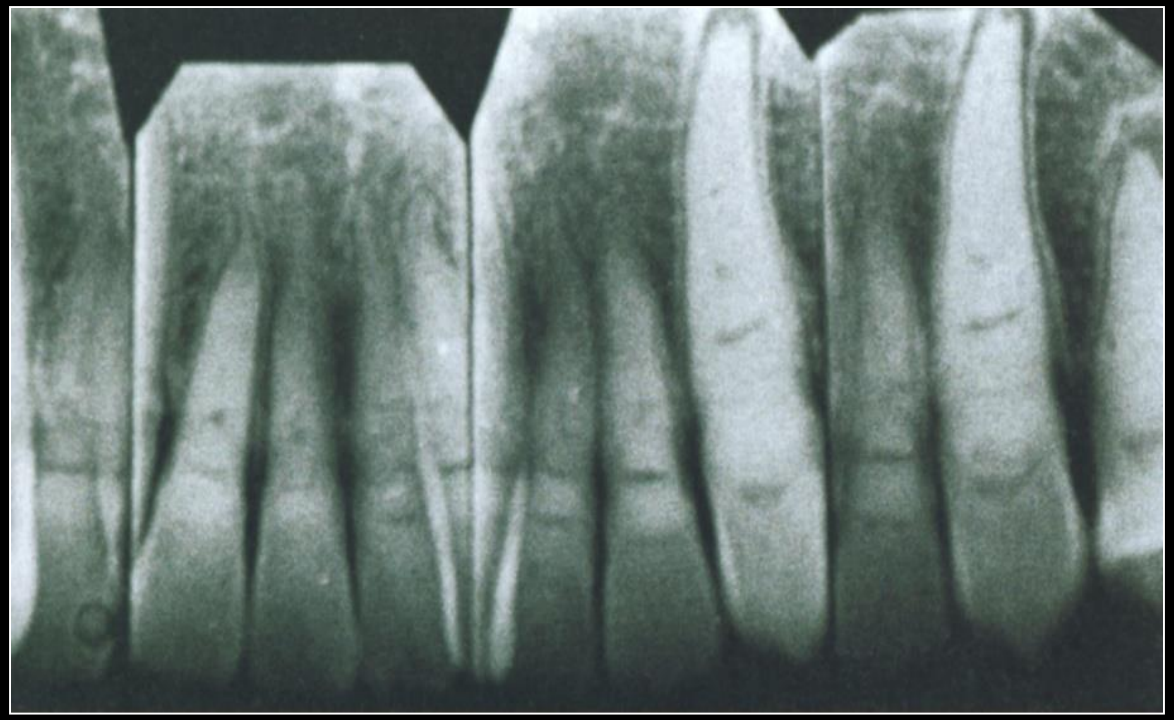
X-ray :

- in both dentition roots short conical & blunt
- Deciduous teeth : pulp chamber & root canal completely obliterated :pre-eruptively
- Permanent teeth : crescent shaped pulpal remnants seen in pulp chamber

  - **important feature** – periapical radiolucency representing granulomas , cysts , abscess



TYPE – I Radicular dentin dysplasia

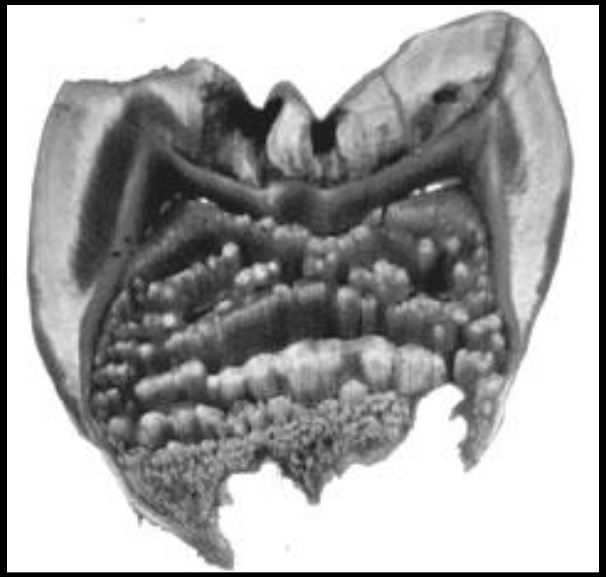


Permanent dentition- cresent shaped pulpal ramnents

Type – I Radicular dentin dysplasia

H/F : coronal enamel normal

- Pulp obliterated by calcified dentinal tubules osteodentin
- New dentin characteristic appearance – **'lava flowing around boulders**
- E/M – **cascade of dentin**



Type-II Coronal dentin dysplasia

- Both dentition different clinically , radiographically & histologically
- Contrast to type I root length is normal in both dentition

Deciduous teeth : resemble to dentinogenesis imperfecta

- Blur to amber brown translucency

Permanent dentition: normal

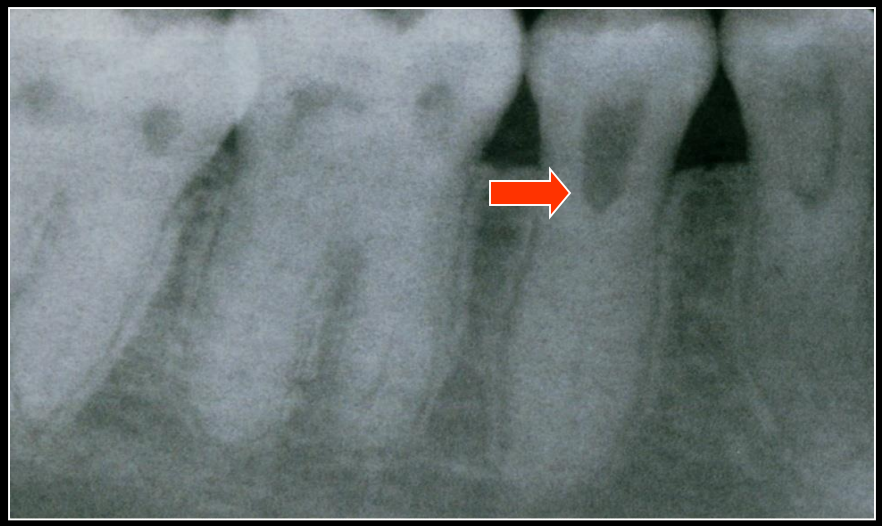
TYPE-II Coronal dentin dysplasia

X-ray :

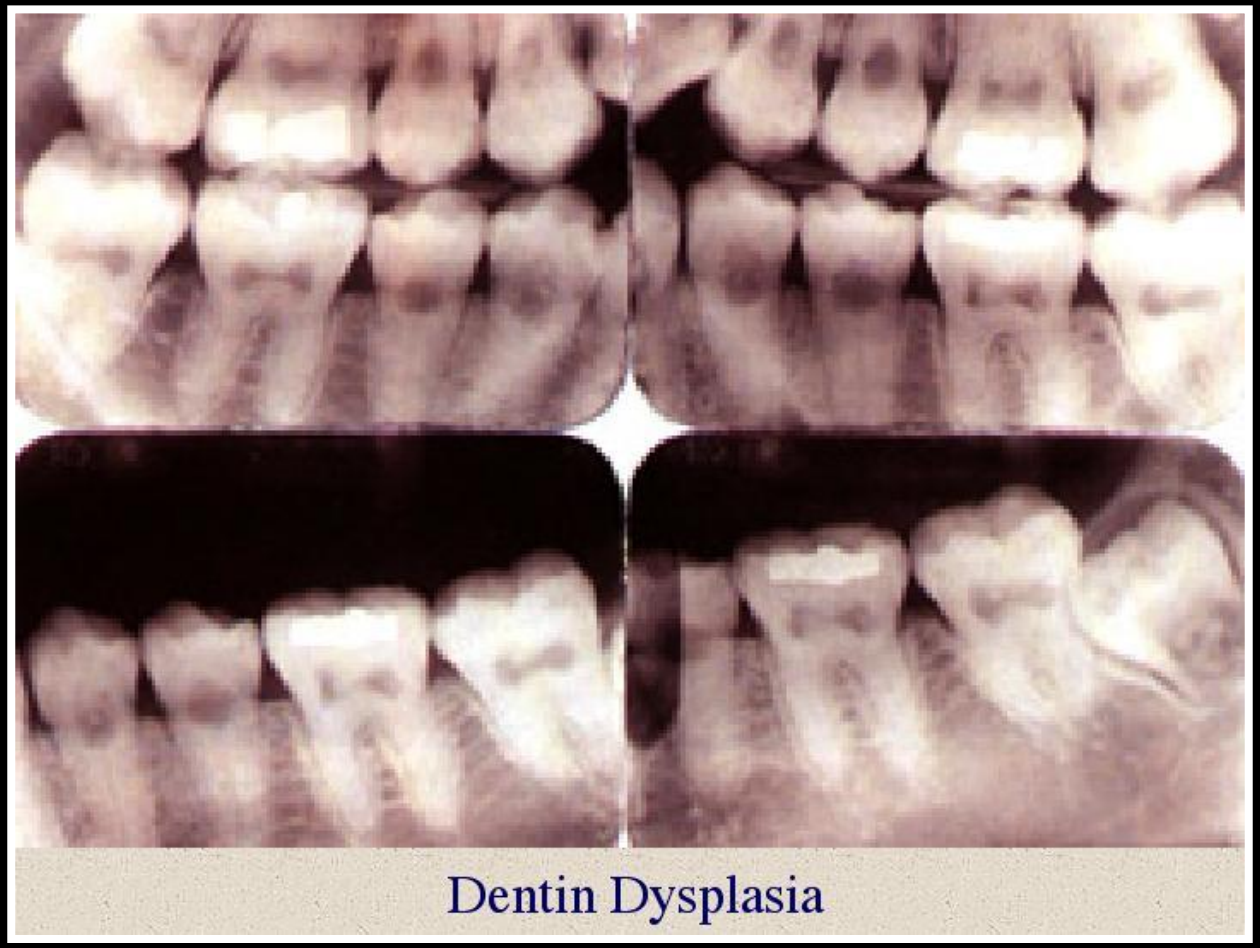
Deciduous dentition: pulp chambers obliterated but not before eruption

Permanent dentition: pulp chamber abnormal shape **Thisle tube** or **flame** shaped appearance

- radiopaque foci – pulp stone
- Periapical radiolucency absent



TYPE-II Coronal dentin dysplasia



Regional odontodysplasia (Ghost teeth)

- Localised , anomaly of enamel & dentin
- One or more teeth in localised area affect
- common - maxillary teeth
- Maxillary central , lateral incisors , cuspids commonly affected
- Both dentitions
- Etiology – unknown
- No history of trauma or systemic illness

C/f : delay or failure of eruption

- Shape of teeth irregular with defective mineralization

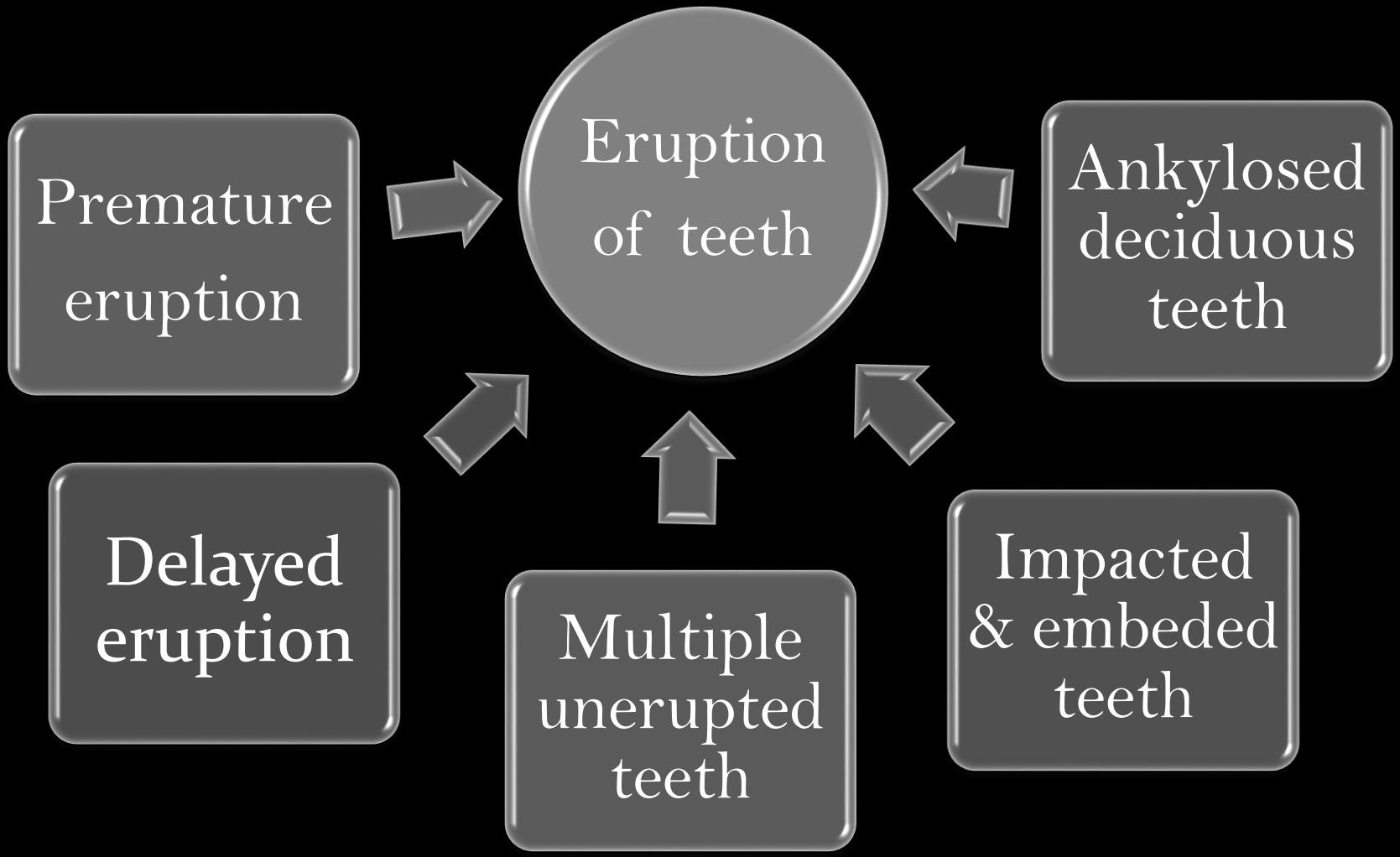
X-ray: extremely thin enamel & dentin

- Surrounding enlarged pulp
- Marked reduction of radiodensity
- Appear as ghost teeth

H/f : reduction in amount of enamel & dentin

- Widening of predentin layer
- Large area of interglobular dentin
- Characteristically REE around non erupted teeth – calcified bodies

Eruption of teeth


Eruption of teeth
Premature eruption
Ankylosed deciduous teeth
Delayed eruption
Multiple unerupted teeth
Impacted & embeded teeth

Premature eruption

- Includes natal & neonatal teeth
- One or two teeth erupt prematurely mandibular central incisors

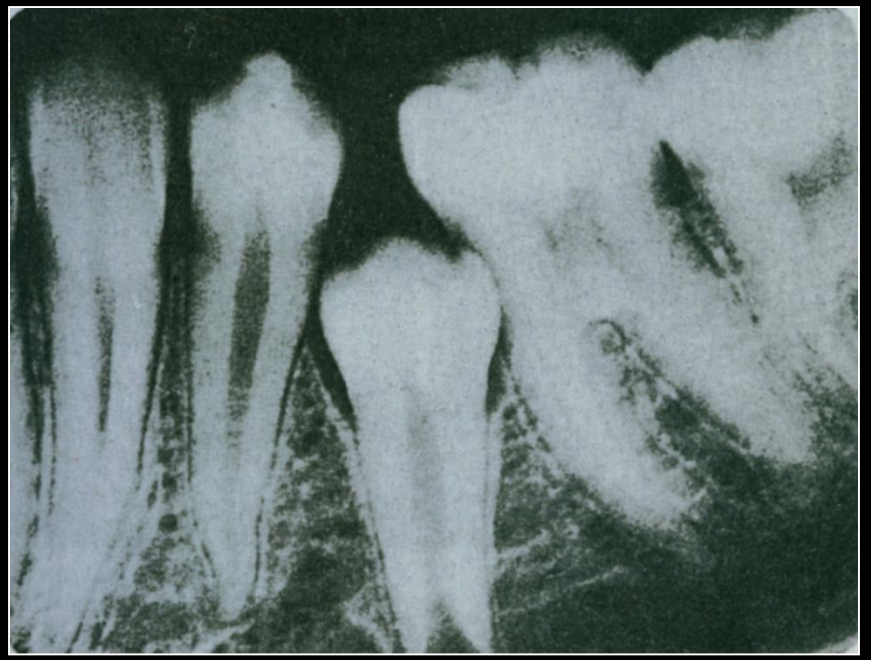
  (deciduous)
- Etiology not known
- Erupted teeth normal in all respect except mobile
- Should be retained even though nursing difficulties
- Premature eruption of permanent teeth – sequelae of premature loss of deciduous teeth

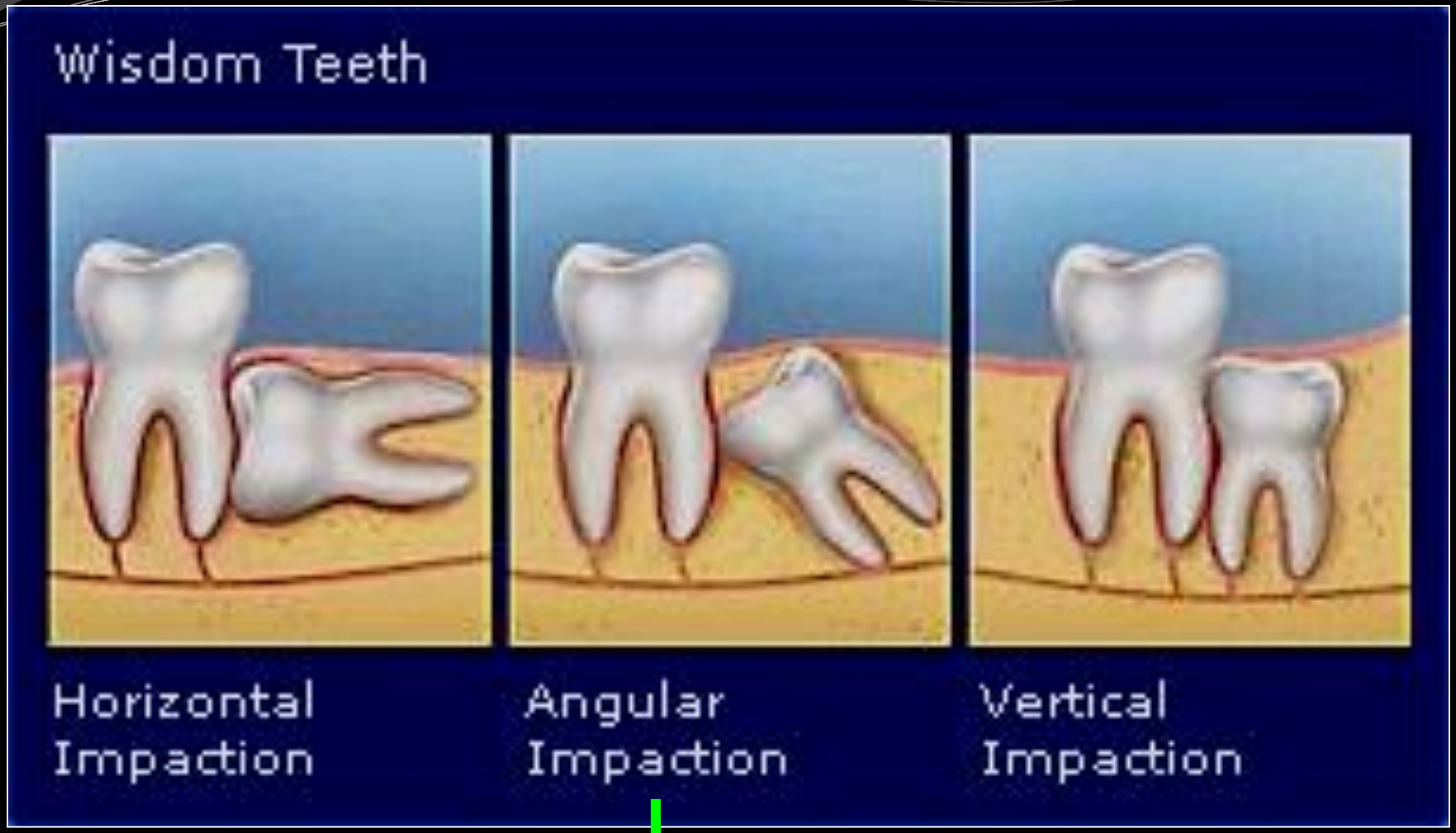
Delayed eruption

- When eruption is grossly overdue
- Etiology unknown
- Systemic : rickets , cretinism , & cleidocranial dysplasia
- Local factors : fibromatosis gingivae

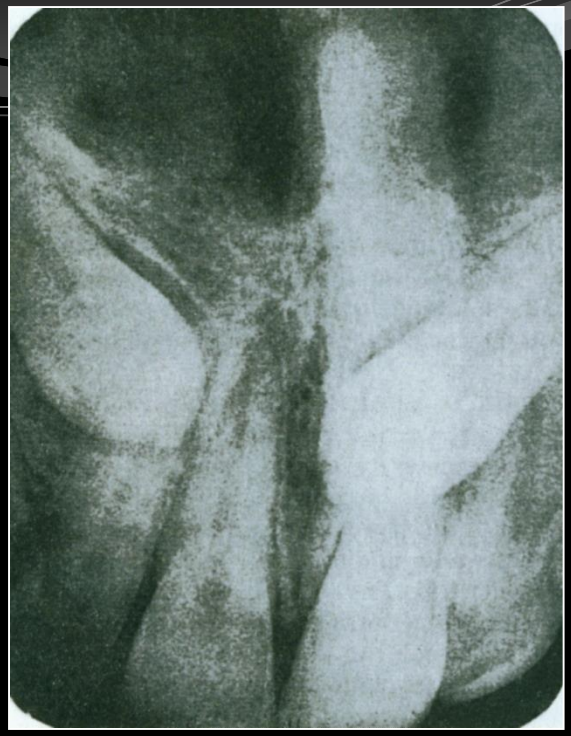
3) Embedded & impacted teeth

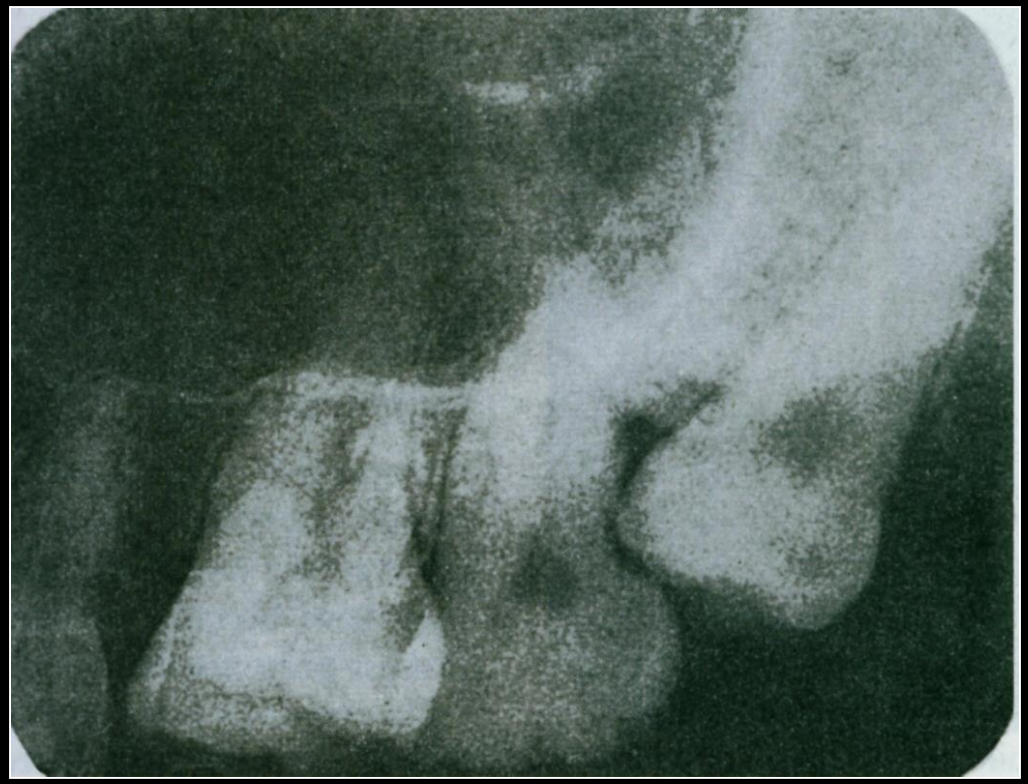
- **Embedded teeth** -teeth not erupted because of lack of eruptive force
- **Impacted teeth** – not erypted because of physical barrier in eruption path
- Lack of space due to crowding , premature loss of deciduous teeth
- Third molars & maxillary canines most commonly impacted teeth




Wisdom Teeth
Horizontal Impaction
Angular Impaction
Vertical Impaction
Mesioangular
Distoangular


D





Eruption sequestrum

- Associated with eruption of teeth in children

C/f: tiny , irregular bony spicule overlying crown of permanent molar

- As cusp emerge , spicule separated from mucosa & lost

X-ray: separated tiny irregular opacity over central fossa of molar tooth

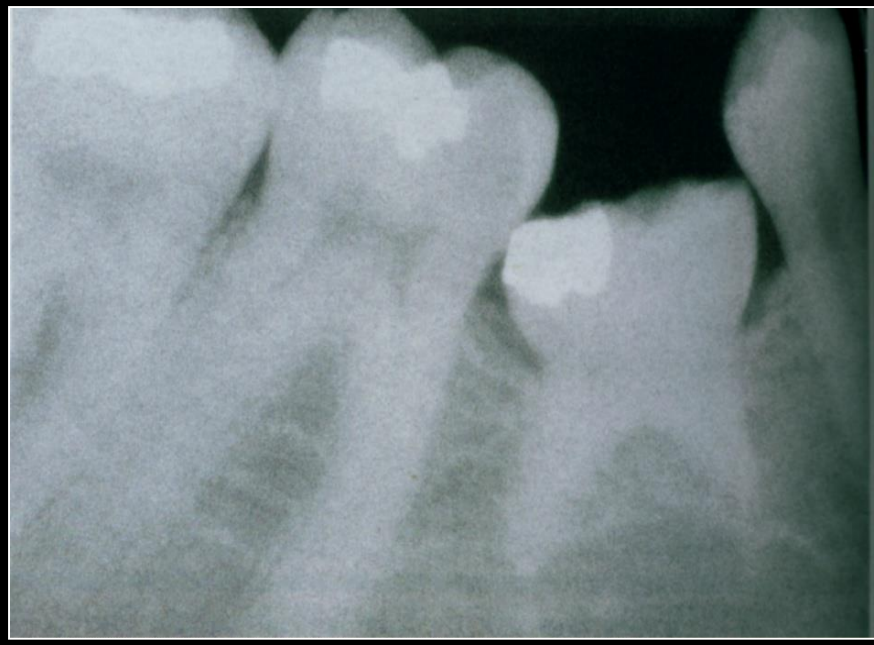
Etiology : usually undergo resorption

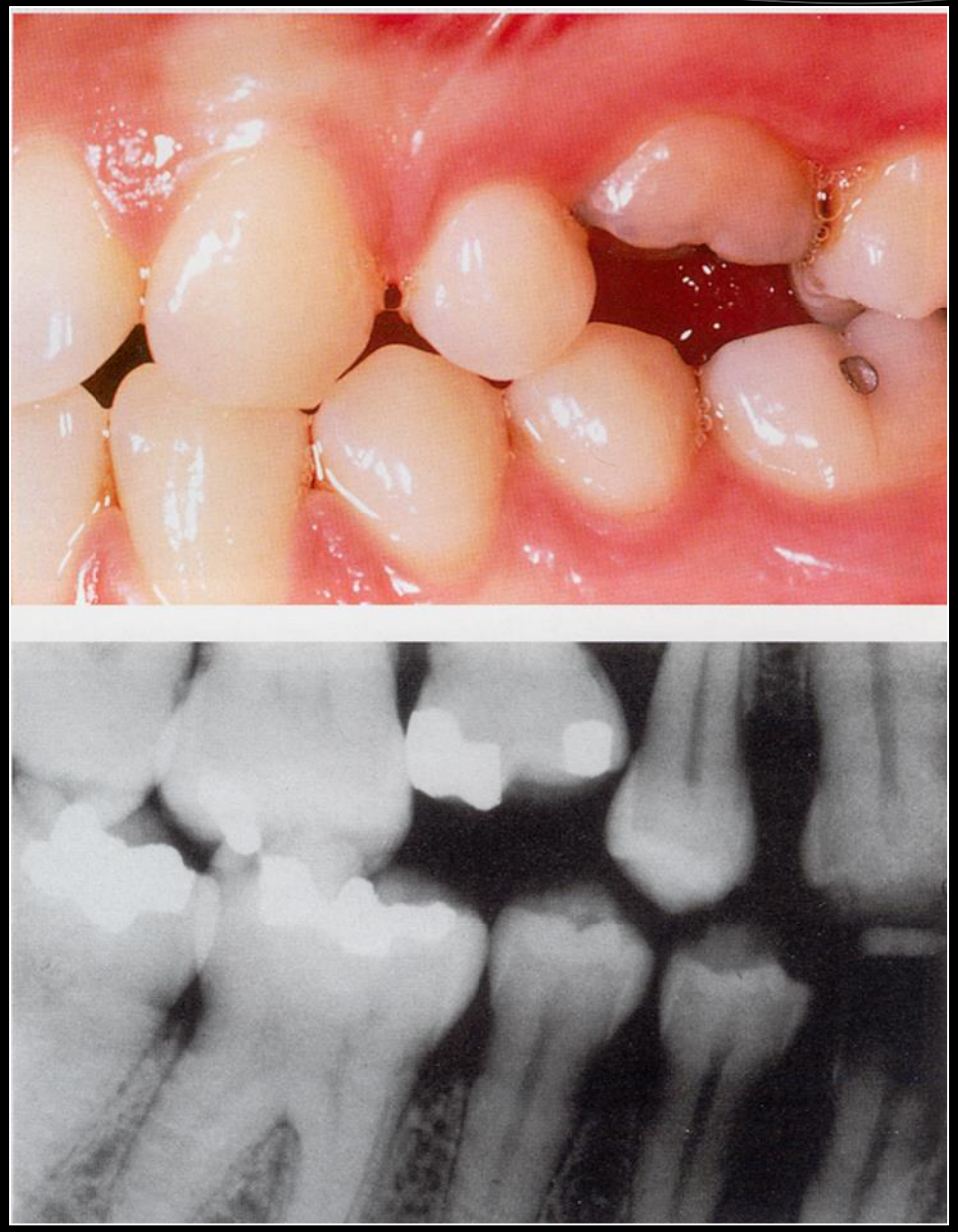
- Eruption fast & spicule larger resorption can not take place

Importance : complain of pain due compression

Ankylosed deciduous teeth (Submerged teeth)

- Most common mandibular 2nd molar
- Undergone resorption & ankylosed, prevent exfoliation & replacement
- Occlusal level submerged after eruption of permanent molars
- Suspected clinically diagnosed by x-ray
- Lack of mobility
- Upon percussion – solid sound
- X-ray : blending of root with bone
- Etiology – not known – trauma or infection





Questions S.N.

- Anodontia
- Supernumerary teeth mesiodens
- Predeciduous dentition
- Natal & Neonatal teeth
- Gemination
- Fusion
- Concrescence
- Dilaceration
- Taurodontism
- Dense in dente
- Talon cusp
- Supernumerary roots
- Amelogenesis imperfecta
- Dentinogenesis imperfecta
- Dentin dysplasia
- Ghost teeth
- Impacted & embedded teeth
- Submerged teeth
- Eruption sequestrum

F.Q.

- Enamel hypoplasia
- No. of teeth
- Shape of teeth
- Eruption of teeth
- Structure of teeth