

Developmental defects of the Oral and Maxillofacial region

(Teeth, Soft tissue, Bone)

م.م عبير صلاح سلمان

Development disorders of teeth

- The development of teeth is regulated by genes, but the genetic program is very sensitive to disturbances in the environment such as *infection, or toxic chemicals.*

- Disorders of development of teeth may be due to abnormalities in the differentiation of the dental lamina and the tooth germs, causing anomalies number, size, form of teeth and abnormalities of morph differentiation or abnormalities in the formation of the dental hard tissue resulting in disturbances in tooth structure

*Developmental Alterations in the
Size of Teeth*



Microdontia

- In **generalized** microdontia, all teeth in the dentition appear smaller than normal. Teeth may actually be measurably smaller than normal, as in **pituitary dwarfism**, or they may be relatively small in comparison with a large mandible and maxilla.
- In **focal**, or localized, microdontia, a single tooth is smaller than normal. The shape of these microdents is often altered with the reduced size. This phenomenon is most commonly seen with maxillary lateral incisors in which the tooth crown appears cone or peg shaped, prompting the designation *peg lateral*.
- Peg laterals are of no significance other than cosmetic appearance.
- The second most commonly seen microdont is the maxillary third molar, followed by supernumerary teeth .



Figure 2-50 ♦ Diffuse microdontia. Dentition in which the teeth are smaller than normal and widely spaced within the arch.



Figure 2-51 ♦ Isolated microdontia (peg lateral). Small, cone-shaped right maxillary lateral incisor.

Macrodontia

- **Generalized** macrodontia is characterized by the appearance of enlarged teeth throughout the dentition. As seen in **pituitary gigantism**.
- it may be relative owing to a disproportionately small maxilla and mandible.
- **Focal, or localized**, macrodontia is characterized by an abnormally large tooth or group of teeth. This relatively uncommon condition usually with **mandibular third molars**.
- In the rare condition known as *hemifacial hypertrophy*, teeth on the affected side are abnormally large compared with the unaffected side.

Developmental Alterations in the Number of Teeth

Anodontia

- Absence of teeth is known as *anodontia*.
- *complete anodontia*, when all teeth are missing
- *partial anodontia* or *hypodontia*, when one or several teeth are missing.
- *pseudoanodontia*, when teeth are absent clinically because of impaction or delayed eruption
- *false anodontia*, when teeth have been exfoliated or extracted.



Complete anodontia is rare but is often associated with a syndrome known as *hereditary ectodermal dysplasia*

- Partial anodontia , few teeth that are present are usually conical.
- Hair, cutaneous appendages, and nails are also poorly developed in this syndrome.



Hereditary ectodermal dysplasia resulting in lack of hair (including eyebrows and eyelashes) and poorly developed sweat glands.



Hypodontia

- Failure of development of **one or two teeth**
- relatively **common** and often **hereditary**.
- **third molars, second premolars, or maxillary second incisors.**
- Hypodontia is a feature in many rare syndromes but the only common one is **Down's syndrome**. One or more third molars are absent in over 90% of these patients.



Supernumerary Teeth

- Extra teeth in the dentition
- result from continued proliferation of the permanent or primary dental lamina to form a third tooth germ.
- Most are isolated or familial
- others may be syndrome associated (Gardner's syndrome and cleidocranial dysplasia).
- The anterior midline of the maxilla is the most common site, *mesiodens*.
- The maxillary molar area (fourth molar or *paramolar*) is the second most common site.

Mesiodens.



- Teeth appearing at the time of birth are known as *natal teeth*
- those appearing within 30 days of life are called *neonatal teeth*.
- Most of these teeth represent prematurely erupted deciduous teeth, usually mandibular central incisors.

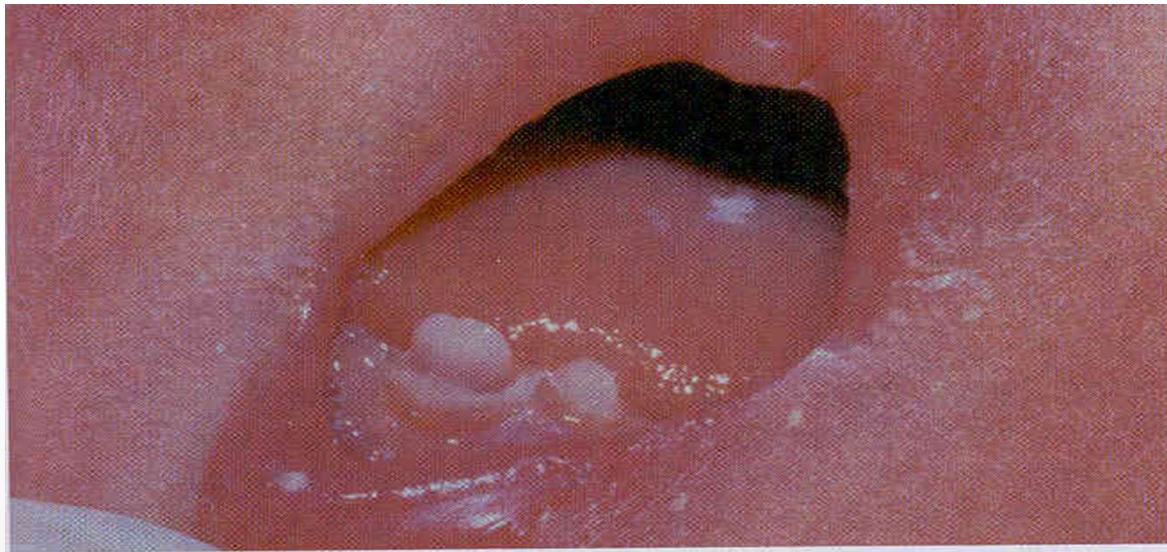


Figure 2-49 • **Natal teeth.** Mandibular central incisors that were erupted at birth.

- Supernumerary teeth appearing after loss of the permanent teeth are known as *postpermanent dentition*.
- This is generally regarded as a rare event.
- Most teeth appearing after extraction of the permanent teeth are believed to arise from eventual eruption of previously impacted teeth.

Supernumerary premolar.



Developmental Alterations in the Shape of Teeth

Gemination

- It is the fusion of two teeth from a single enamel organ.
- The typical result is partial cleavage, with the appearance of two crowns that share the same root canal.
- Complete cleavage, or twinning, occasionally occurs, resulting in two teeth from one tooth germ.
- Although **trauma** has been suggested as a possible cause, the cause of gemination is unknown.
- These teeth may be cosmetically unacceptable and may cause crowding..



Figure 2-53 • **Gemination.** Mandibular bicuspid exhibiting bifid



Figure 2-52 • **Bilateral gemination.** Two double teeth. The tooth count was normal when each anomalous tooth was counted as one.



Fusion

- is the joining of two developing tooth germs, resulting in a single large tooth structure.
- The fusion process may involve the entire length of the teeth, or it may involve the roots only, in which case cementum and dentin are shared.



Fusion.

Root canals may also be separate or shared. The cause of this condition is unknown, although trauma has been suggested.



Gemination and fusion appear similar and may be differentiated by assessing the number of teeth in the dentition



Figure 2-55 • Fusion. Double tooth in the place of the mandibular right lateral incisor and cuspid.

Concrescence

- Form of fusion in which adjacent, already formed teeth are joined by cementum only.
- This may take place **before or after eruption** of teeth and is believed to be related to trauma or overcrowding. Mostly seen in permanent than primary dentition. (**maxillary second and third molars**)



Figure 2-59 • Concrescence. Union by cementum of adjacent maxillary molars.

Dilaceration

- an extraordinary curving or angulations of tooth roots.
- The cause of this condition:
trauma during root development or Hereditary

Eruption generally continues without problems. However, extraction may be difficult, in addition, if root canal fillings are required in these teeth, the procedure is

- challenging



ACCESSORY CUSPS

The cuspal morphology of teeth exhibits minor variations among different populations.

(1) **Cusp of Carabelli**: an accessory cusp located on the palatal surface of the mesio lingual cusp of a maxillary molar. The cusp is most pronounced on the **first molar**.



Figure 2-62 ♦ **Cusp of Carabelli.** Accessory cusp on the mesio-lingual surface of the maxillary first molar.

2-Talon cusp A talon cusp (dens evaginatus of anterior tooth) is a well-delineated additional cusp that is located on the surface of an anterior tooth and extends at least half the distance from the cemento-enamel junction to the incisal edge.



Figure 2-63 • Talon cusp. Accessory cusp present on the palatal surface of the maxillary left central incisor. Note the three-pronged pattern, which resembles an eagle talon.

Enamel Pearls (enameloma):

- Droplets of ectopic enamel, may occasionally be found on the roots of teeth.
- **Bifurcation or trifurcation area of Maxillary molars** are more commonly affected than **mandibular molars**.
- This developmental disturbance of enamel formation may be detected on radiographic examination.
- It generally is of little significance except when located in an area of periodontal disease. because a periodontal ligament attachment would not be expected and hygiene would be more difficult.

Enamel pearl.



Supernumerary_Roots

mandibular canines, premolars, and molars (especially third molars). They are rarely found in upper anterior teeth and mandibular incisors. Radiographic recognition of an extraordinary number of roots becomes important when extractions or root canal fillings are necessary.

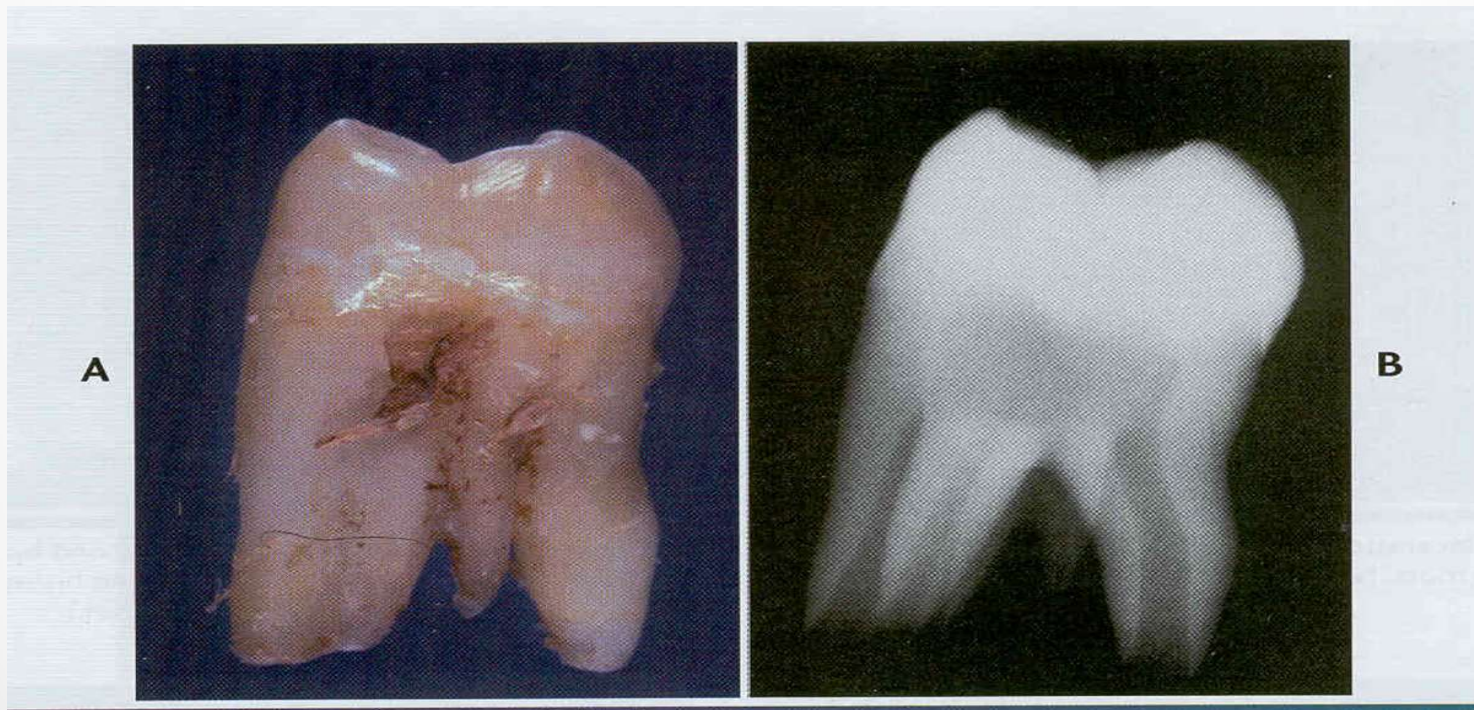


Figure 2-87 ♦ Supernumerary root. A, Gross photograph exhibiting a maxillary molar with a small supernumerary root. B, Mesial-to-distal radiographic view exhibiting the accessory root with central pulp canal. If a buccal-to-lingual radiographic view had been taken (as would be necessary in patient care), the additional root would not have been evident.

Disorders of eruption

Local factors affecting eruption of deciduous teeth

erupt unobstructed. Occasionally an eruption cyst may overlie a tooth but is unlikely to block eruption.

Local factors affecting eruption of permanent teeth

causes:

- 1- Loss of space (too early loss of a deciduous predecessor tends to cause irregularities because movement of adjacent teeth closes the available space)
- 2- Abnormal position of the crypt
- 3- Overcrowding
- 4- Supernumerary teeth
- 5- Displacement in a dentigerous cyst
- 6- Retention of a deciduous predecessor

Impaction:

- common event that most often affects the **mandibular third molars and maxillary canines**. Less commonly, **premolars, mandibular canines, and second molars** are involved.
- Impaction occurs because of obstruction from crowding or from some other physical barrier.

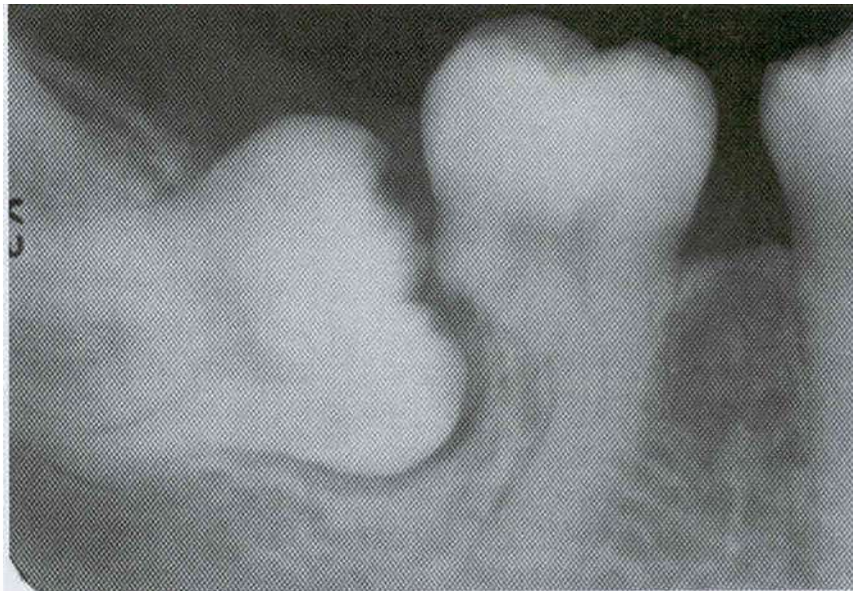


Figure 2-37 • Impaction-related tooth resorption. Mesio-angular impaction of the right mandibular third molar associated with significant resorption of the distal root of the second molar. (Courtesy of Dr. Richard Brock.)

Ankylosis, the fusion of a tooth to surrounding bone, is another cause of impaction. This usually occurs in association with erupted primary molars.

- The reason for ankylosis is unknown, but it is believed to be related to periapical inflammation and subsequent bone repair. With focal loss of the periodontal ligament, bone and cementum become mixed, causing fusion of the tooth to alveolar bone.



Figure 2-38 • Ankylosis. Deciduous molar well below the occlusal plane of the adjacent teeth.



Figure 2-39 • Ankylosis. Radiograph of an ankylosed deciduous molar. Note the lack of periodontal ligament space.

Environmental effects On Tooth Structure Development

Environmental Defects of Enamel

During enamel formation, ameloblasts are susceptible to various external factors that may be reflected in erupted teeth. Metabolic injury, if severe enough and long enough, can cause defects in the **quantity and shape of enamel or in the quality and color of enamel.**

- Quantitatively defective enamel, when of normal hardness, is known as ***enamel hypoplasia.***
- Qualitatively defective enamel, in which normal amounts of enamel are produced but are hypomineralized, is known as ***enamel hypocalcification.*** In this defect, the enamel is softer than normal.

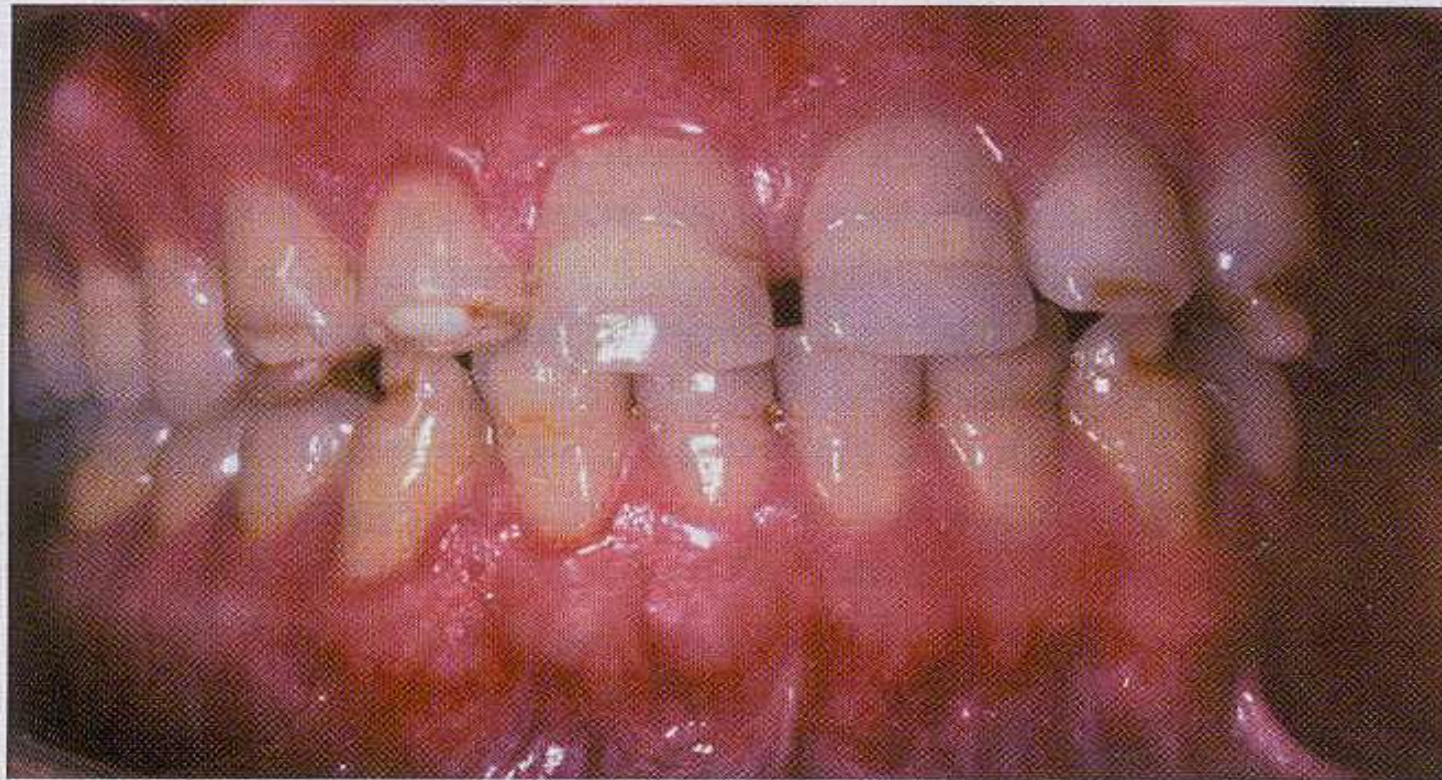


Figure 2-1 ♦ **Environmental enamel hypoplasia.** Bilaterally symmetric pattern of horizontal enamel hypoplasia of the anterior dentition. Maxillary central incisors have been restored previously. (From Neville BW, Damm DD, White DK: *Color atlas of clinical oral pathology*, ed 2, Baltimore, 1999, Williams & Wilkins.)

Genetic

Amelogenesis Imperfecta

- It is a clinically and genetically heterogeneous group of disorders of enamel formation that affect both dentitions.
- Most cases of amelogenesis imperfecta fall into one of two clinical types: **hypoplastic** or **hypocalcified**. A third type, known as **hypomaturation**, has been added to the list.
- Results from defective amelogenin genes on X and Y chromosomes and also chromosome 4



- **hypoplastic type of amelogenesis imperfecta**, teeth erupt with insufficient amounts of enamel, ranging from pits and grooves in one patient to complete absence (aplasia) in another. Because of reduced enamel thickness in some cases, abnormal contour and absent interproximal contact points may be evident.
- **hypocalcified type**, the quantity of enamel is normal, but it is soft and friable, so that it fractures and wears readily.



Figure 2-89 • Hypoplastic amelogenesis imperfecta, generalized pitted pattern. Note the numerous pinpoint pits scattered across the surface of the teeth. The enamel between the pits is of normal thickness, hardness, and coloration. (From Stewart RE, Prescott GH: *Oral facial genetics*, St Louis, 1976, Mosby.)



Figure 2-95 ♦ Hypomaturational amelogenesis imperfecta.
Dentition exhibiting mottled, opaque white enamel with scattered areas of brown discoloration.

DEFECTS OF DENTIN

Dentinogenesis Imperfecta

- It is an autosomal-dominant trait with variable expressivity.
- Dentinogenesis imperfecta has been divided into three types:
- **type I** or syndrome-associated, in which the dentin abnormality occurs in patients with osteogenesis imperfecta, primary teeth are more severely affected than permanent teeth.
- **type II**, patients have only dentin abnormalities and no bone disease.
- **type III**, or the (Brandywine type) ,only dental defects occur. This type is similar to type II, but has some clinical and radiographic variations.
- Features of type III that are not seen in types I and II include multiple pulp exposures, periapical radiolucencies, and a variable radiographic appearance.



Figure 2-101 • **Dentinogenesis imperfecta.** Dentition exhibiting diffuse brownish discoloration and slight translucence.

Radiographically

types I and II exhibit identical changes.

- Opacification of dental pulps occurs as the result of continued deposition of abnormal dentin.
- The short roots and the bell-shaped crowns are also obvious on radiographic examination.

In type III, the dentin appears thin and the pulp chambers and root canals extremely large, giving the appearance of thin dentin shells—hence the previous designation of *shell teeth*.

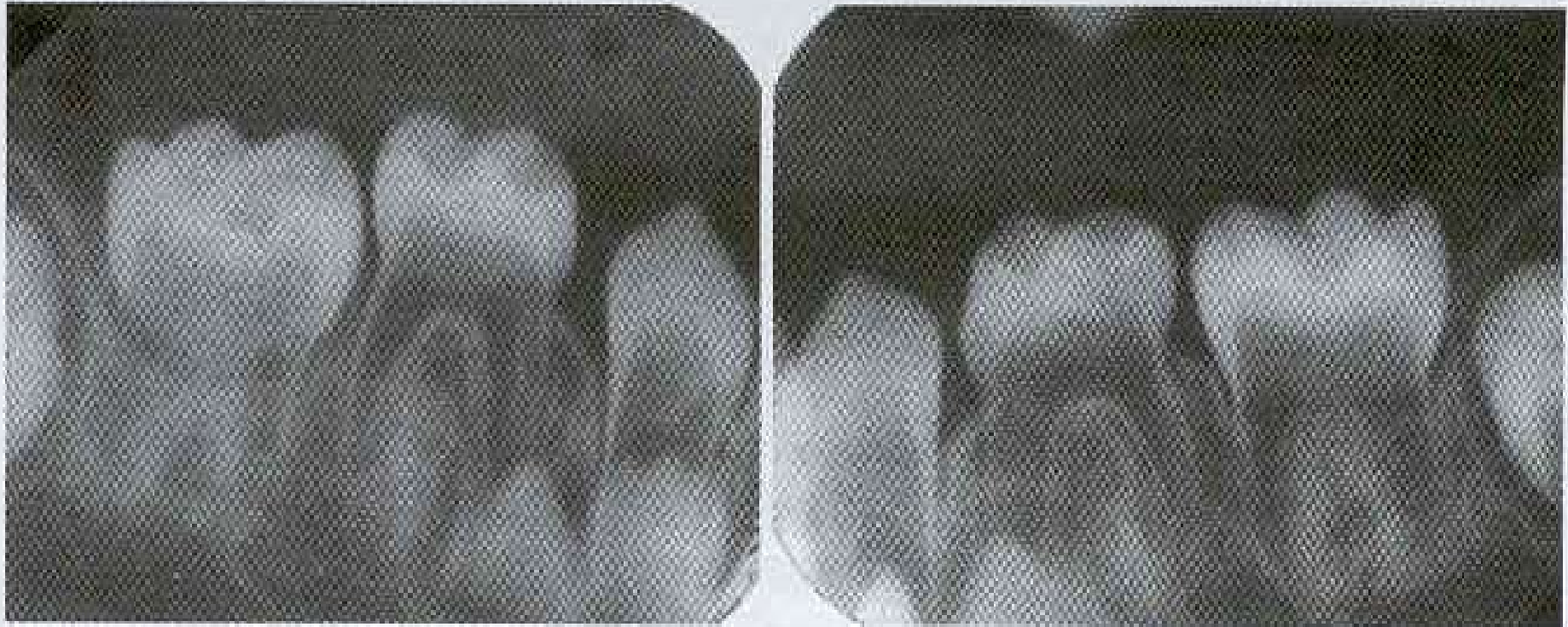


Figure 2-105 • **Shell teeth.** Dentition exhibiting normal thickness enamel, extremely thin dentin, and dramatically enlarged pulps.

Post developmental Loss of Tooth structure

Attrition is the physiologic wearing of teeth as a result of mastication. It is an age-related process.



Figure 2-10 ♦ **Attrition.** Extensive loss of coronal tooth height without pulp exposure in patient with anterior edge-to-edge occlusion.

Abrasion is the pathologic wearing of teeth caused by an abnormal habit or abnormal use of abrasive substances orally. Pipe smoking, tobacco chewing, aggressive tooth brushing, and use of abrasive dentifrices are among the more common causes.



Figure 2-11 • Abrasion. Horizontal cervical notches on the anterior mandibular dentition.

Erosion is the loss of tooth structure through a nonbacterial chemical process. Most commonly, acids are involved in the dissolution process from an external or an internal source.

- Externally, in the diet (e.g., citrus fruits, acid-containing soft drinks).
- The internal source of acid may be seen in any disorder of which chronic vomiting is a part.
- The pattern of erosion associated with vomiting is usually generalized tooth loss on the lingual surfaces of maxillary teeth. However, all surfaces may be affected.

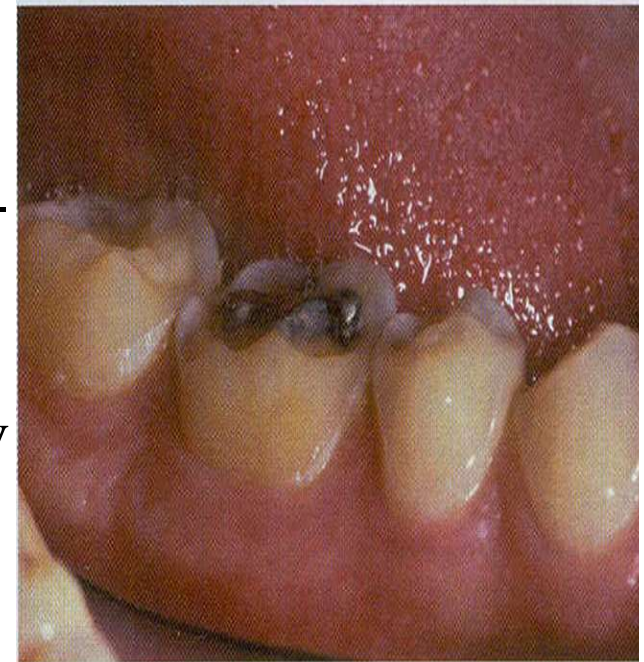


Figure 2-15 • Erosion. Extensive loss of buccal and occlusal tooth structure. Note that the amalgam margins are above the surface of the dentin.