牙體形態學Dental morphology

Dental anomalies

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學習目標

❿能辨識及敘述牙齒之形態、特徵與功能意義，並能應用於臨床診斷與治療

1. 牙齒形態相關名辭術語之定義與敘述
2. 牙齒號碼系統之介紹
3. 牙齒之顎間關係與生理功能形態之考慮
4. 恒齒形態之辨識與差異之比較
5. 乳齒形態之辨識與差異之比較
6. 恒齒與乳齒之比較
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10. 牙科人類學與演化發育之探討

參考資料

1. Woelfel, J.B. and Scheid, R.C: Dental Anatomy--Its Relevance to Dentistry, ed. 6, Lippincott Williams & Wilkins, Philadelphia, 2002.
2. Jordan, R.E. and Abrams, L.: Kraus' Dental Anatomy and Occlusion, ed. 2, Mosby Year Book, St. Louis,1992.
3. Ash, M.M.and Nelson, S.J.: Wheeler's Dental Anatomy, Physiology and Occlusion, ed. 8, W.B. Saunders Co., 2003.

Summary

I. Anodontia: absence of teeth
   A. Total anodontia
   B. Partial anodontia
II. Extra or supernumerary teeth
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   E. Reactions to injury after tooth eruption
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OBJECTIVES This chapter is designed to help the learner perform the following:

~ Identify variations from the normal (anomalies) for the number of teeth in an arch.

~ Identify anomalies in crown morphology and, when applicable, identify the anomaly by name and give a possible cause (etiology).

~ Identify anomalies in root morphology and, when applicable, identify the anomaly by name and give a possible cause (etiology).

~ Identify anomalies in the alignment of teeth within an arch. An anomaly [ah NOM ah lee] is a deviation from normal, usually related to embryonic development that may result in the absence, excess, or deformity of body parts.

~ Dental anomalies are abnormalities of teeth that range from such "common" occurrences as malformed permanent maxillary lateral incisors that are peg shaped to such rare occurrences as complete anodontia (no teeth at all). Dental anomalies are most often caused by hereditary factors (gene related) or by developmental or metabolic disturbances. While more anomalies occur in the permanent than primary dentition and in the maxilla than the mandible, it is important to remember that their occurrence is rare. For example, only 1-2% of the population have some form of anodontia (one or more missing teeth), while another 1-2% have supernumerary (extra) teeth.

~ When specific deformities or abnormal formations of teeth occur with greater frequency, it is difficult to determine whether the deviation is a "true" anomaly or simply an extreme variation in tooth morphology.

Familiarity with dental anomalies is essential to the clinical practice of dentistry and dental hygiene. Recognition and correct labeling of anomalies is important when communicating with other dental team members, especially in the case of referral to or from another dental office. Additionally, your communication with the patient (or, in the case of a child, the parent) should reflect knowledge of abnormal oral conditions.

Your assurance that the fused front tooth of a 4-year-old child occurs with 0.5% frequency and rarely affects the number of teeth in the permanent dentition will go a long way to promote the patient's confidence in you and the office.

Likewise, the informed patient who understands why the accessory cusp on the buccal of his maxillary or mandibular molar is more prone to decay than normal will likely be more receptive to home care instructions that are specific to his mouth and his needs. Finally, understanding the etiology (cause) of the anomaly is important in determining the course of treatment, if any. Additional information related to the etiology of the following anomalies is found in the study of both oral histology/embryology and oral pathology.

Section I. Anodontia: Absence of teeth

A. TOTAL ANODONTIA

True anodontia [an o DON she ah] is the total congenital absence of a set of teeth. Total anodontia is characterized by the absence of the entire primary and secondary dentitions and is extremely rare. It is most often associated with a generalized congenital deformation (a sex-linked genetic trait) such as the abnormal development of the ectoderm or outer embryonic cell layer. Faulty ectodermal development further affects such structures as hair, nails, sebaceous and sweat glands, and salivary glands.

B. PARTIAL ANODONTIA

Partial anodontia, also referred to as congenitally missing teeth, involves one or more missing teeth from a dentition. Though not proven to be a hereditary trait, tendencies toward missing the same tooth do run in families.

B. PARTIAL ANODONTIA

1. MOST COMMONLY MISSING PERMANENT TEETH

The most commonly missing permanent teeth are third molars, with the maxillary thirds absent from the dentition more often than the mandibular thirds.

B. PARTIAL ANODONTIA

2. SECOND MOST COMMONLY MISSING TEETH

The permanent maxillary lateral incisors are the next most commonly missing teeth (Fig. 12-1). Approximately 1-2% of the population are missing one or both of these maxillary incisors.

B. PARTIAL ANODONTIA

3. THIRD MOST COMMONLY MISSING TEETH

The mandibular second premolars are the third most frequently missing permanent teeth (seen on a radiograph in Fig. 12-2), with 1% of the population missing one or both. [Some studies indicate the order of most commonly missing teeth to be third molars, maxillary and mandibular premolars, and maxillary lateral incisors. Some observers state that missing teeth follow evolutionary trends in that the teeth most commonly missing from the dentition (third molars) are those that are most expendable in terms of their role in oral function. Conversely, the most stable teeth in the permanent dentition, the canines, are the least likely to be absent from the dentition. Other congenitally missing permanent and deciduous teeth are evident in Figure 12-3.

Section II. Extra or supernumerary teeth

Supernumerary teeth are teeth that form in excess of the normal dental formulas for each quadrant (deciduous quadrant: I-2, C-1, M-2; permanent quadrant: I-2, C-1, P-2, M-3). They occur in 0.3-3.8% of the population. They are found in both permanent and deciduous dentitions, with 90% of all occurrences in the maxilla. Specifically, the most frequent supernumerary specimens are found in one of two locations: maxillary incisor area (Fig. 12-4) or maxillary third molar region. One report states that supernumerary teeth occurred eight times more often in the maxillary than mandibular regions, and twice as frequently in men than in women. Another study of 50 patients from 16 months to 17 years of age found 20% of the supernumerary teeth to be inverted. Fourteen percent of these patients had multiple supernumerary teeth, and 80% of the extra teeth were in a lingual position relative to the dental arch. These teeth can vary considerably in size and shape (Fig. 12-5).

A. MAXILLARY INCISOR AREA

A mesiodens is a small supernumerary tooth that forms between central incisors. It has a cone-shaped crown and short root (Fig. 12-6). It may be visible in the oral cavity or remain unerupted. If unerupted, a diastema (space) may be present. One study of 375 children with mesiodens reports that they are often in an inverted position and rarely erupt into the oral prevalence of mesiodens in the permanent dentition in the Caucasian populations is 0.15-1.9%. Less frequently, supernumerary teeth may be positioned between central and lateral incisors or between lateral incisors and canines. The occurrence of supernumerary teeth in the deciduous dentition is low (approximately 0.5%). The most common supernumerary teeth in the secondary dentition, however, are either midline mesiodens or supplemental lateral incisors.

B. THIRD MOLAR AREA

The presence of supernumerary teeth distal to the third molars is more common in the maxillary arch but does occur in the mandible. These supernumerary teeth are often called dlstomolars, paramolars, or fourth molars. These extra teeth rarely erupt into the oral cavity and thus are usually discovered through radiographs (Fig. 12-7).

C. MANDIBULAR PREMOLAR AREA

The most common location for supernumerary teeth in the mandible is the second premolar region (Fig. 12-8). Supernumerary teeth appearing in this area generally resemble normal premolars in size and shape.

Section III. Abnormal tooth morphology

A. ABNORMAL CROWN MORPHOLOGY

1. THIRD MOLAR MALFORMATIONS

Maxillary third molars have the most variable crown shape of all permanent teeth followed by mandibular thirds. These anomalies can range in shape from a small peg-shaped crown to a multi-cusped, malformed version of either the first or second molar.

A. ABNORMAL CROWN MORPHOLOGY

2. PEG-SHAPED LATERAL INCISORS

The most common anomaly in tooth shape in the anterior region of the secondary dentition is the peg-shaped (or cone-shaped) lateral incisor (Fig. 12-10), occurring in 1-2% of the population. The tooth is generally conical in shape and broadest cervically, and tapers toward the incisal to a blunt point. Several studies of identical twins seem to indicate that missing and peg-shaped lateral incisor teeth may be varied expressions of the same genetic trait. A most unusual occurrence is that of peg-shaped maxillary central incisors (Fig. 12-11). Peg-shaped teeth develop from one facial lobe (instead of the three facial lobes normally present on anterior teeth).

A. ABNORMAL CROWN MORPHOLOGY

3. GEMINATION ORTWINNING

Gemination or twinning results from the splitting or twinning of a single forming tooth (germ). Since the tooth division is incomplete, the twinned crown appears doubled in width compared to a single tooth and possibly notched (Fig. 12-12A). The single root is not split and has a common pulp canal. Most commonly seen in the anterior area in the region of the maxillary incisors and canines, this condition occurs in less than 1% of the population. It occurs more frequently in the primary dentition than in the permanent dentition. If the doubled tooth is counted as two teeth, the dental arch containing the geminated tooth will generally have an extra tooth beyond the normal number of teeth. Note in Figure 12-12B that the wide crowns of the anterior teeth of Native Americans may exhibit deep labial grooves that resemble gemination.

A. ABNORMAL CROWN MORPHOLOGY

4. FUSION

Fusion is the union of two adjacent tooth germs, always involving the dentin. Upon clinical examination, this condition appears similar to gemination since the fused teeth have one crown that appears doubled in width. However, unlike gemination, radiographs usually reveal two separate but fused roots with separate pulp chambers (Fig. 12-13). Another way to differentiate fusion from gemination is to count the teeth in the arch. If the fused teeth are counted as two, the total number of teeth will reflect the normal number of teeth in that arch (Fig. 12-14). Like geminated teeth, fused teeth occur more commonly in the anterior portion of the mouth (in less than 1% of the population), and more often in the deciduous dentition than in the permanent dentition. The mandibular incisor area is affected more often than the maxilla. Fusion is thought to be caused by pressure or force during development of adjacent roots. Many of the reports of fusion involve a supernumerary tooth joining with an adjacent tooth, such as the fusion of a mandibular third and fourth molar seen in Figure 12-15, and the fusion of a maxillary lateral incisor and anterior supernumerary tooth seen in Figure 12-16

A. ABNORMAL CROWN MORPHOLOGY

5. HUTCHINSON'S TEETH

Unusual incisor and molar shapes may occur in both dentitions as the result of prenatal syphilis. Maxillary and mandibular incisors may be screwdriver shaped, broad cervically, and narrowing incisally, with a notched incisal edge. These teeth are often referred to as Hutchinson's incisors. Note in Figure 12-17 that the crowns of Hutchinson's incisors resemble somewhat the notched crowns of fused teeth seen in Figure 12-14. Also, first molars in these dentitions may have occlusal anatomy made up of multiple tiny tubercles with poorly developed indistinguishable cusps. Because of the berry-like shape on the occlusal, these molars are called mulberry molars.

A. ABNORMAL CROWN MORPHOLOGY

6. VARIATIONS IN THE NUMBER OF LINGUAL CUSPS ON MANDIBULAR SECOND PREMOLARS

Mandibular second premolars vary in the number of lingual cusps, ranging from one to three (recall Table 6-4). Occlusal morphology can vary greatly in terms of groove and fossa patterns established by the number of lingual cusps.

A. ABNORMAL CROWN MORPHOLOGY

7. ACCESSORY (EXTRA) ROOTS

Usually occurring in teeth whose roots form after birth, accessory roots are probably caused by trauma, metabolic dysfunction, or pressure. Third molars are the multirooted teeth most likely to exhibit accessory roots (Fig. 12-32A). Other molars may also develop extra roots, as seen on a mandibular second molar in Figure 12-32B. The single-rooted teeth most frequently affected are the mandibular canines and premolars. Two roots (one facial and one lingual) are found rarely enough on mandibular canines to be interesting, but frequently enough not to be amazing (Fig. 12-33A).

Mandibular first premolars may also exhibit a bifurcated root, one buccal and one lingual (Fig. 12-33B), a condition less common for this tooth than for mandibular canines. A Japanese study of 500 mandibular first premolars found that this type of bifurcation occurred in 1.6% of their teeth. These researchers also found one very rare specimen with three roots, two buccal and one lingual. A somewhat rare occurrence of two roots on mandibular premolars (one mesial and one distal) is evident in the radiographs in Figure 12- 33C.

Another unusual root formation includes maxillary first premolars with three roots (two buccal and one lingual) similar to the roots of a maxillary molar (Fig. 12-34). The somewhat rare occurrence of the primary maxillary canines with their root divided mesiodistally is shown in Figure 2-35. There have been six reported cases of contralaterally bifurcated roots on primary maxillary canines: five discovered from routine radiographic examination, the sixth on a routine dental recall examination.

A. ABNORMAL CROWN MORPHOLOGY

7. ACCESSORY CUSPS~ TUBERCLES~ OR RIDGES

Any tooth may exhibit extra small enamel projections called tubercles (Fig. 12-18), or extra accessory cusps. These enamel projections may result from developmental localized hyperplasia (increase in volume of tissue caused by growth of new cells), or crowded conditions prior to eruption may result in fusion of a supernumerary tooth, which may be appear similar to an extra cusp (Fig. 12-19). A third lingual cusp may develop on mandibular molars on the lingual surface, and is called a tuberculum [too BER ku lum] intermedlum (Fig. 12-20). If this extra cusp were located on the distal marginal ridge, it would be called a tuberculum sextum. Finally, an unusual prominent ridge is seen on the facial surface of a maxillary central incisor in Figure 12-21.

7. ACCESSORY CUSPS~ TUBERCLES~ OR RIDGES

a. Enamel Pearls

Enamel pearls are small, round nodules of enamel with a tiny core of dentin. They are found most frequently on the distal of third molars and the buccal root furcation of molars (Fig. 12-22). Radiographically, enamel pearls appear as small round radiopacities (that is, areas appearing light or white on the exposed film). Being covered with enamel, they prevent the normal connective tissue attachment and consequently may channel disease (periodontal problems) into this region.

7. ACCESSORY CUSPS~ TUBERCLES~ OR RIDGES

b. Taurodontla

In taurodontia, or so-called bull or prism teeth, the pulp chamber is very long, without a constriction near the cementoenamel junction (Fig. 12-23). This occurs only in permanent teeth, with a frequency of less than 1 in 1000 among American Indians and Eskimos. Taurodontia is caused by a disorganization of the calcified tissues and possibly occurs in dentitions subjected to heavy use.

7. ACCESSORY CUSPS~ TUBERCLES~ OR RIDGES

c. Talon Cusp

A small enamel projection in the cingulum area of maxillary or mandibular anterior permanent teeth is a talon ("claw of an animal") cusp (Fig. 12-24A). Frequently, the cusp has a pulp horn so that radiographically it may be mistaken for a supernumerary tooth superimposed over an anterior tooth or dens in dente (described later in this chapter). Removal of this cusp is often necessary because of its interference in jaw closure in the maximum intercuspal position. Since the pulp horn is present, endodontic treatment is usually required when this cusp is removed. Notice that the deep lingual grooves found on some anterior teeth may somewhat resemble the grooves of a talon cusp (Fig. 12-24B).

A. ABNORMAL CROWN MORPHOLOGY

8. VARIATIONS IN TOOTH SIZE

Microdontia (very small, but normally shaped teeth) and macrodontia (very large, but normally shaped teeth) may occur as a single tooth, several teeth, or an entire dentition. Macrodontia most frequently involves incisors and canines, whereas microdontia affects maxillary lateral incisors and third molars. Some examples of variation in size of teeth are shown in Figure 12-25. One report shows a maxillary canine 39 mm long and a maxillary first molar 31 mm long (compared to average lengths of 26.3 mm and 20.1 mm, respectively), both removed from a pituitary giant.

A. ABNORMAL CROWN MORPHOLOGY

9. SHOVEL-SHAPED MAXILLARY INCISORS

Possibly not a true anomaly, shovel-shaped incisors are a frequently occurring trait that reflect biologic differences between races. The lingual anatomy includes a pronounced cingulum and marginal ridges, thus the scoop or "shovel" appearance (Fig. 12-26A). These teeth are observed most frequently in the Asian, Mongoloid, Eskimo, and American Indian races. Double shoveling refers to the pronounced lingual marginal ridges, as well as prominent ridges on the mesial and distal portions of the labial surface as seen in Figure 12-26B.

B. ABNORMAL ROOT MORPHOLOGY

Root malformations are not usually obvious without the aid of radiographs. Close examination of extracted specimens reveals wide variations.

B. ABNORMAL ROOT MORPHOLOGY

1. DILACERATION OR FLEXION

Dilaceration [di las er A shun] is a severe bend or distortion of a tooth root and/or crown, often approximating an angle from 45° to more than 90° (Fig. 12-27). This unusual occurrence may be the result of a traumatic injury or of insufficient space for development, as is often the case with third molars (Fig. 12-28). Flexion is another term used to describe a sharp curvature or bend (less than 90°) on a tooth root. Dilaceration and flexion are often observed in teeth with accessory roots.

B. ABNORMAL ROOT MORPHOLOGY

2. DENS IN DENTE

Dens in dente (literally "tooth within a tooth") is a developmental anomaly resulting from the invagination of the enamel organ within the crown of a tooth. Clinically, it appears as a deep crevice primarily in the cingulum region of incisors. Most commonly found in maxillary lateral incisors, it can appear in upper central incisors and in mandibular incisors. Radiographically, dens in dente appears as a mass of elongated enamel within the dentin of a normal-sized tooth (Fig. 12-29A and B). Usually, it appears in the coronal third of the tooth, but may extend the entire root length. Often peg-shaped lateral incisors, with failure of mesial and distal lobes to develop, are found to have dens in dente upon radiographic examination. Their occurrence is from 1 to 5% of the population.

B. ABNORMAL ROOT MORPHOLOGY

3. CONCRESCENCE

Concrescence [kon KRES ens] is a type of superficial fusion or growing together of two adjacent teeth at the root through the cementum only (Fig. 12-30). Unlike fusion, the teeth involved are originally separate but become joined, usually after eruption into the oral cavity, because of the close proximity of the roots and excessive cementum deposition. This anomaly occurs most frequently in the maxillary molar region.

B. ABNORMAL ROOT MORPHOLOGY

4. DWARFED ROOTS

Maxillary teeth often exhibit normal-sized crowns with abnormally short (dwarfed) roots (seen in Fig. 12-25). The incisal edge is usually displaced lingually as in the mandibular incisors. This condition is often hereditary; however, isolated or generalized dwarfing of roots may also result from orthodontic movement of the teeth (with braces) when the movement has occurred too rapidly.

B. ABNORMAL ROOT MORPHOLOGY

5. HYPERCEMENTOSIS

Hypercementosis is the excessive formation of cementum around the root of a tooth after the tooth has erupted (Fig. 12-31). It may be caused by trauma, metabolic dysfunction, or periapical inflammation. The excess amount of cementum may cause webbing of the roots.

B. ABNORMAL ROOT MORPHOLOGY

6. ACCESSORY (EXTRA) ROOTS

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Another unusual root formation includes maxillary first premolars with three roots (two buccal and one lingual) similar to the roots of a maxillary molar (Fig. 12-34). The somewhat rare occurrence of the primary maxillary canines with their root divided mesiodistally is shown in Figure 12-35. There have been six reported cases of contralaterally bifurcated roots on primary maxillary canines: five discovered from routine radiographic examination, the sixth on a routine dental recall examination.

C. ANOMALIES IN TOOTH POSITION

1. UNERUPTED (IMPACTED) TEETH

Unerupted teeth are embedded teeth that fail to erupt into the oral cavity because of a lack of eruptive force. Impacted teeth, on the other hand, fail to erupt due to mechanical obstruction, often related to the evolutionary decreasing size of modern man's jaw. At least 10% of the population have impacted teeth, which most often include maxillary and mandibular third molars (Fig. 12-36) and maxillary canines.

C. ANOMALIES IN TOOTH POSITION

2. MISPLACED TEETH (TRANSPOSITION)

Occasionally, tooth buds seem to get out of place, causing teeth to emerge in peculiar locations. The most common tooth involved is the maxillary canine seen in Fig. 12-37 (20 of 25 cases reported), followed by the mandibular canine (Fig. 12-38). Maxillary canines can even be transposed to the central incisor region.

C. ANOMALIES IN TOOTH POSITION

3. TOOTH ROTATION

Rotation is a rare anomaly, most common for the maxillary second premolar, sometimes the maxillary incisor, first premolar, or mandibular second premolar. A tooth may be rotated on its axis by as much as 180° (see rotated maxillary second premolar in Fig. 12-39).

C. ANOMALIES IN TOOTH POSITION

4. ANKYLOSIS

Teeth that erupt into the oral cavity but fail to reach occlusion with the opposing arch appear submerged or ankylosed. Ankyiosis [ang ki LO sis] may be initiated by an infection or trauma to the periodontal ligament. The ankylosed tooth has lost its periodontal ligament space and is truly fused to the alveolar process or bone. Deciduous mandibular second molars most often fail to continue erupting as the jaw grows. Many times, the ankylosis occurs when the permanent suc cessor is missing. Consequently, the ankylosed tooth will be 2-4 mm short of occluding with an opposing tooth.

D. ADDITIONAL TOOTH MALFORMATIONS AND DISCOLORATIONS

Additional tooth malformations, including those that tend to affect the entire dentition rather than one or two specific teeth and those related to heredity and injury during formation, should be recognized.

D. ADDITIONAL TOOTH MALFORMATIONS AND DISCOLORATIONS

1. ENAMEL DYSPLASIA

Enamel dysplasia is a broad term used to describe abnormal enamel development. Specifically, it is any disturbance in the ameloblasts during the enamel matrix formation. Enamel hypocalcification, on the other hand, is a disturbance in the maturation of the enamel matrix. Enamel dysplasia may be hereditary (amelogenesis imperfecta), or could result from systemic causes (such as drugs, infection, and nutritional deficiencies) or local disturbances (such as trauma and periapical infection). Generally, variations in color (from white to yellow and brown) or morphology (pitted and roughened enamel) can result. Relatively common occurrences include the following:

1. ENAMEL DYSPLASIA

a. Amelogenesis Imperfecta

Amelogenesis imperfecta [ah mi lo JEN e sis im per FEC ta] is a hereditary disorder that affects the enamel formation of both dentitions (Fig. 12-40 and Color Plate 22). The partial or complete lack of enamel results in rough yellow to brown crowns that are highly susceptible to decay. This condition is extremely rare, with an incidence in the United States of 1 in 15,000.

1. ENAMEL DYSPLASIA

b. Fluorosis

Fluorosis is a condition caused during enamel formation by the ingestion of a high concentration of fluorine in drinking water that greatly exceeds the concentration recommended for controlling decay. The fluorine content of some naturally occurring mineral water that causes this condition is many times greater than the one part per million that is added to drinking water in many cities to effectively reduce the prevalence of decay. If during enamel formation unerupted teeth are exposed to high concentrations of ingested fluoride, the tooth can exhibit a color change from white to yellow/brown spots called mottled enamel, and if severe, the tooth enamel can undergo a morphologic change resulting in the formation of pits within the enamel (pitted enamel) (seen in Fig 12-41 and on erupting secondary maxillary incisors in Color Plate 23). Clinically, all permanent teeth may be involved. These teeth are generally very resistant to decay.

1. ENAMEL DYSPLASIA

c. Enamel Damage Due to High Fever

Pitted enamel on permanent teeth is often the result of early childhood fever from such diseases as measles. Usually, the specific crowns that are developing at the time of the fever are affected (Fig. 12-42). Thus, there are identifiable patterns, such as the pitting of enamel in all permanent first molars as well as the permanent incisors.

1. ENAMEL DYSPLASIA

d. Focal Hypomaturation

Focal hypomaturation or hypoplasia is seen as a localized chalky white spot on a tooth. During enamel formation, this condition may result from trauma, a local infection of an adjacent abscessed primary tooth, or some other interference in enamel matrix maturation, most likely to occur in succedaneous teeth (called Turner's tooth, or Turner's hypoplasia seen in Fig. 12-43). Unlike decalcification (early decay), which usually forms around the cervical thirds of teeth or occlusal surfaces of posterior teeth, hypomaturation generally appears in the middle third of the smooth crown surfaces (facial and lingual surfaces). The underlying enamel is usually soft, and thus, the area is susceptible to decay (Color Plate 24).

D. ADDITIONAL TOOTH MALFORMATIONS AND DISCOLORATIONS

2. DENTIN DYSPLASIA

Dentin dysplasias occur twice as often as those in enamel (1 in 8000). Anomalies of the dentin include those with hereditary and systemic causes as follows.

2. DENTIN DYSPLASIA

a. Dentinogenesis Imperfecta

Dentinogenesis [den ti no JEN e sis] imperfecta is a hereditary disorder that affects the dentin formation of both dentitions. Clinically, all teeth have a light blue-gray to yellow, somewhat opalescent appearance (Fig. 12-44 and Color Plate 25A), hence the term opalescent dentin. Radiographically, there is partial or total absence of pulp chambers and root canals (Color Plate 25B). These teeth are weak because of a lack of support in the dentin and, as with amelogenesis imperfecta, are esthetically displeasing.

2. DENTIN DYSPLASIA

b. Tetracycline Stain

When antibiotic tetracyclines are taken either by a pregnant woman, an infant, or a child during the time of tooth formation and calcification, it can be incorporated in developing dentin. Clinically, the resultant staining is generalized in the deciduous dentition, ranging in color, depending on the dose of the drug, from yellow to gray-brown (Fig. 12-45 and Color Plate 26). Some permanent teeth may also be affected, depending on the age at which tetracycline was prescribed. Since only the teeth that are calcifying during the tetracycline therapy are stained, it is possible to confirm this condition by noting the age when tetracycline was given and comparing this to the teeth that were calcifying at that age (see Table 10-1). Staining from tetracycline antibiotic therapy during tooth formation has often been erroneously blamed by some on community fluoridated drinking water, which is beneficial for both teeth and general health.

Table 10-1A

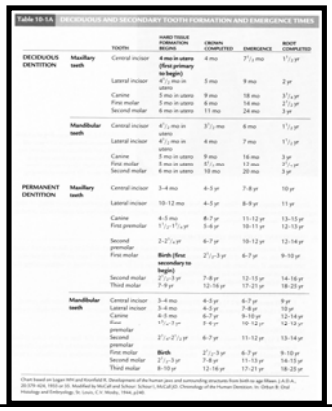

Table 10-1B

Table 10-1B TOOTH DEVELOPMENT AND ERUPTION: PRIMARY TEETH

		HARD TISSUE FORMATION BEGINS (WEEKS IN UTERO)	ENAMEL COMPLETED (MONTHS AFTER BIRTH)	ERUPTION (MONTHS)	ROOT COMPLETED (YEAR)
Maxillary	Central incisor	14	$1^1/_2$	10 (8–12)	$1^1/_2$
	Lateral incisor	16	$2^1/_2$	11 (9–13)	2
	Canine	17	9	19 (16–22)	$3^1/_4$
	First molar	$15^1/_2$	6	16 (12–19 boys) (14–18 girls)	$2^1/_2$
	Second molar	19	11	29 (25–33)	3
Mandibular	Central incisor	14	$2^1/_2$	8 (6–10)	$1^1/_2$
	Lateral incisor	16	3	13 (10–16)	$1^1/_2$
	Canine	17	9	20 (17–23)	$3^1/_4$
	First molar	$15^1/_2$	$5^1/_2$	16 (14–18)	$2^1/_4$
	Second molar	18	10	27 (23–31 boys) (24–30 girls)	3

From Lunt RC, Law DB. A review of the chronology of deciduous teeth. J Am Dent Assoc 1974;89:872.

E. REACTIONS TO INJURY AFTER TOOTH ERUPTION

Reactions to injury are not really anomalies but are unique changes in tooth morphology associated with a specific cause. It is important to recognize these conditions so that their etiology (causes) can be identified and modified, when possible, to avoid the causative factor(s) that could worsen the condition.

E. REACTIONS TO INJURY AFTER TOOTH ERUPTION

1. ATTRITION

Attrition is the wearing away of enamel and dentin from the movement of mandibular teeth against maxillary teeth during normal function and is made worse by excessive grinding or gritting together of teeth known as bruxism. Two examples of severe attrition are shown in Figure 12- 46. Stress greatly increases bruxism. This condition must be recognized and distinguished from other forms of tooth wear such as abrasion and erosion.

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2. ABRASION

The wearing away of tooth structure by mechanical means is called abrasion. Abrasion from improper tooth brushing most often results in worn enamel on the facial surfaces of premolars and canines at the cementoenamel junction (Fig. 12-47). It is caused by use of a hard toothbrush and/or a horizontal brushing stroke and/or a gritty dentifrice. Occlusal abrasion results from chewing or biting hard foods or objects, or from chewing tobacco, and results in flattened cusps on all posterior teeth and worn

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3. EROSION

Erosion is the loss of tooth structure from chemical (nonmechanical) means and affects smooth and occlusal surfaces. Erosion can be the result of excessive intake or use of citric acid (lemons), incisal edges (appearing similar to attrition). An unusual type of abrasion, caused by the use for many years of a toothpick between the maxillary central incisors, has been reported by Melfi. The same type of proximal abrasion has been reported from the use of a straight pin for the same purpose over many years. A similar-looking condition resulting from tooth bending (flexure) of the tooth caused by heavy occlusal forces is called abfraction [ab FRAC shun].

Although not yet supported by research, this condition is thought to result in loss of tooth structure due to separation of enamel rods near the cervical line. carbonated beverages, or industrial acids, or the result of regurgitated stomach acids (seen in bulimic individuals who habitually induce vomiting, as in the "binge and purge" syndrome). Erosion can also occur from an unknown cause (idiopathic) (Fig. 12-48). Severe erosion of the lingual enamel of all maxillary anterior teeth is evident in Color Plate 27. Careful inspection reveals that at least one pulp horn has been exposed on the maxillary left lateral incisor.

F. UNUSUAL DENTITIONS

During a routine check of a dental hygiene student's completed oral prophylaxis on a 23-year-old man, the instructor noticed what appeared to be an oblique ridge and cusp of Carabelli on the left mandibular first molar. Alginate impressions were made and casts poured (Fig. 12-49). Careful examination of the casts by both the instructor and Dr. Woelfel revealed not only that the mandibular left first molar closely resembled a maxillary first molar, but also that first and second mandibular premolars and first, second, and third mandibular molars on both sides were remarkably similar morphologically to maxillary posterior teeth. The mandibular six anterior teeth unquestionably belonged to the mandibular dentition. The occlusion of the young man's teeth was remarkably good considering the fact that maxillary posterior teeth were occluding against practically identical maxillary teeth on both sides. A most unusual maxillary dentition with a total of 24 erupted or partially erupted teeth is seen in Figure 12-50. This was the maxillary dentition of a foreign exchange student from Africa. There are 4 incisors, 1 canine, 6 premolars, and 13 molars (5 of which somewhat resemble mandibular molars).