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Tooth Morphology
Chapter 12

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Learning Objectives
Lesson 12.1: Anterior Permanent Dentition

1. Pronounce, define, and spell the key terms.
2. Discuss the anterior permanent dentition, including the following:
   - Identify the location of each anterior permanent tooth.
   - Use the correct terminology when discussing features of the anterior permanent dentition.
   - Describe the general and specific features of each tooth in the anterior permanent dentition.
   - Discuss clinical considerations of each tooth in the anterior permanent dentition.

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Introduction

- There is a certain amount of variation among individual teeth, and every tooth may not meet all criteria for identification.
- By understanding the characteristics of each tooth, you will be able to differentiate among teeth, as well as between the left teeth and the right teeth in any particular group.
Clinical Uses for Tooth Morphology
- Mounting dental radiographs
- Assisting in charting a mouth with missing teeth and teeth that have “drifted”
- Selecting temporary crowns or orthodontic bands from a box with a variety of shapes
- Forming matrix bands before application

Anterior Permanent Dentition
- There are 12 anterior teeth in the permanent dentition, six in each dental arch
- The permanent anterior teeth include the central incisors, lateral incisors, and canines
- The central incisors are closest to the midline, the lateral incisors are the second teeth from the midline, and the canines are the third teeth from the midline
- All anterior teeth are succedaneous, replacing primary teeth of the same type

Attractive Teeth Are Important
Characteristics of Permanent Anterior Teeth

- All anterior teeth have a cingulum, a rounded, raised area on the cervical third of the lingual surface.
- The cingulum corresponds to the lingual developmental lobe.
- The lingual surface on anterior teeth has rounded, raised borders on the mesial and distal surfaces called marginal ridges.
- Some anterior teeth have a fossa, which is a wide, shallow depression on the lingual surfaces.

Newly Erupted Permanent Maxillary Incisor

- There are eight permanent incisors: four maxillary and four mandibular.
- The maxillary group comprises two central incisors and two lateral incisors, as does the mandibular group.
- These teeth complement each other in form and function.
- The central incisors erupt about a year or so before the lateral incisors do.
Maxillary Central Incisors

- Maxillary central incisors (#8 and #9) have unique anatomical features
- Larger in all dimensions, especially mesiodistally, than a permanent mandibular central incisor
- Labial surfaces are more rounded from the incisal aspect, with the tooth tapering toward the lingual
- Root is short compared with the roots of other permanent maxillary teeth
- All lingual surface features, including the marginal ridges, lingual fossa, and cingulum, are more prominent on the maxillary central incisor than on the mandibular central incisor

Maxillary Central Incisors (Cont.)

- The incisal edges of these teeth are formed at the labioincisal line angle and do not exist until an edge has been created by wear
- The incisal edge is also known as the incisal surface or incisal plane
- When newly erupted, the central and lateral incisors have three mamelons, or rounded enamel extensions on the incisal ridge, or edge
- The mamelons usually undergo attrition shortly after eruption
Mamelons

Maxillary Lateral Incisors

- The maxillary lateral incisors (#7 and #10) are smaller than the central incisors in all dimensions except root length
- They usually erupt after the maxillary central incisors
- The crown of a maxillary lateral incisor has a single root that is relatively smooth and straight but may curve slightly distally
- Recognizing this feature is helpful in the mounting of radiographs

Maxillary Lateral Incisors (Cont.)

- The lateral incisors vary in form more than any other tooth in the mouth, except the third molars, and are often congenitally missing
- Because of the variations in form, the permanent maxillary lateral incisors present challenges during preventive, restorative, and orthodontic procedures
- Unattractive open contacts (spaces between teeth), called diastema, often occur in this area because of the variations in tooth size and position in the arch
Views of a Permanent Maxillary Right Lateral Incisor

Pegged Maxillary Lateral Incisor

Mandibular Incisors

- The permanent mandibular incisors are the smallest teeth of the permanent dentition and the most symmetric.
- The central and lateral incisors of the mandibular arch resemble each other.
- Generally, the lateral incisor is larger than the central incisor, in contrast to the teeth in the maxillary arch.
- Supragingival tooth deposits, such as plaque, calculus, and stain, tend to collect in the lingual concavity of the mandibular incisors.
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Mandibular Central Incisors

- The mandibular central incisors (#24 and #25) are the smallest and simplest teeth and are bilaterally symmetric.
- Each has a small centered cingulum, subtle lingual fossa, and equally subtle marginal ridges.
- The crown of a mandibular central incisor is narrower on the lingual surface than on the labial surface.
- Developmental horizontal lines on anterior teeth, or imbrication lines, and developmental depressions usually not present or very faint.

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Views of a Permanent Mandibular Right Central Incisor

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Mandibular Lateral Incisors

- The mandibular lateral incisors (#23 and #26) are slightly larger than the mandibular central incisors but otherwise similar to them.
- The lateral teeth usually erupt after the mandibular central incisors.
- The lateral incisors have a small, distally placed cingulum.
- Greater height of the cementoenamel junction (CEJ) curvature on the mesial surface than on the distal surface helps distinguish the right mandibular lateral incisor from the left incisor.
Views of a Permanent Mandibular Right Lateral Incisor

Permanent Canines

- The permanent canines are the four anterior teeth located at the corner of each quadrant for each dental arch.
- Their name is derived from the Latin word for dog (canis) because these teeth resemble dogs' teeth.
- Patients often complain of the normal slightly deeper yellow color of their canines compared with their incisor teeth.

Permanent Canines (Cont.)

- The permanent canines are the longest teeth in the dentition.
- The root is usually the length of the crown.
- This large root is externally manifested by the bony vertical ridge called the canine eminence.
- Patients commonly call the canines their "eye teeth"
Views of Permanent Mandibular and Maxillary Canines

Maxillary Canines
- The maxillary canines (#6 and #11) usually erupt after the mandibular canines, after the maxillary incisors, and possibly after the maxillary premolars
- The cusp tip is sharper on a maxillary canine
- The mesial cusp slope is usually shorter than the distal cusp slope in both the maxillary and the mandibular canines when they first erupt
- The length of these cusp slopes, and the cusp tip can change with attrition

Views of a Permanent Maxillary Right Canine
Mandibular Canines

- The mandibular canines (#22 and #27) usually erupt before the maxillary canines and after most of the incisors have erupted.
- A mandibular canine closely resembles a maxillary canine.
- Although the entire tooth is usually as long, a mandibular canine is narrower labiolingually and mesiodistally than a maxillary canine.
- The lingual surface of the crown of the mandibular canines is smoother than that of the maxillary canines and has a less developed cingulum and two marginal ridges.

Views of a Permanent Mandibular Right Canine

Clinical Considerations with Canines

- The maxillary canines may erupt labially or lingually in relation to the surrounding teeth.
- The maxillary canines may also fail to erupt fully and may remain impacted.
- This occurs because the permanent maxillary canines erupt after the maxillary incisors and possibly after the premolars and their arch spaces have closed.
Learning Objectives
Lesson 12.2: Posterior Permanent Dentition

- Discuss the posterior permanent dentition, including the following:
  - Identify the location of each posterior permanent tooth.
  - Use the correct terminology when discussing features of the posterior permanent dentition.
  - Describe the general and specific features of each tooth in the posterior permanent dentition.
  - Discuss clinical considerations of each tooth in the posterior permanent dentition.

Posterior Permanent Dentition

- The permanent posterior teeth include the premolars and molars
- The crown of each posterior tooth has an occlusal surface, bordered distally and mesially by marginal ridges
- The occlusal surfaces have two or more cusps
- Imagine each cusp as a mountain with sloping areas, or cusp ridges, extending from the top of the mountain; between the ridges are sloping areas called inclined cuspal planes

Occlusal Surface on a Permanent Posterior Tooth

- Cusp ridge
- Cusp tip
- Inclined cuspal plane
- Marginal ridge
Posterior Permanent Dentition (Cont.)

- Each shallow, wide depression on the occlusal table is a fossa
- One type of fossa on posterior teeth, the central fossa, is located where the cusp ridges converge in a central point, where the grooves meet
- Another type of fossa is the triangular fossa
- Sometimes located in the deepest portions of the fossa are occlusal developmental pits
  - Each pit is a sharp pinpoint depression where two or more grooves meet

Features of the Occlusal Table

- Developmental grooves:
  - Supplemental grooves
  - Central groove
  - Triangular groove
- Occlusal pit
- Triangular fossa
- Triangular ridge
- Marginal groove

Clinical Considerations with Posterior Teeth

- The occlusal surfaces on permanent posterior teeth have pit and groove patterns that make them susceptible to caries (decay)
- This occurs because of increased plaque retention and the thinness of the enamel forming the walls of the pits and grooves
- The pits and grooves need to be carefully checked for decay with an explorer and mirror and possibly a chemical caries indicator
Permanent Premolars
- There are eight premolars in the permanent dentition, two in each quadrant.
- They are located posterior to the canines and immediately anterior to the molars.
- There are two types of premolars:
  - First
  - Second

Maxillary First Premolars
- A maxillary first premolar (#5 and #12) is larger than a maxillary second premolar.
- Each maxillary first premolar has two cusps (buccal and lingual) and two roots (facial and lingual).
- Both maxillary premolars erupt earlier than the mandibular premolars.

Maxillary First Premolars (Cont.)
- The maxillary first premolar has a bifurcated root (two roots: one buccal and one lingual).
- Some first premolars have roots that are joined, or fused.
- The roots are shorter in length and resemble the roots of the molars.
Clinical Considerations with Premolars

- The maxillary and mandibular premolars work with the molars in the chewing of food
- The first premolars help the canines in shearing or cutting bits of food
- The premolars also support the corners of the mouth and cheeks

Views of a Permanent Maxillary First Premolar

Maxillary Second Premolars

- Each maxillary second premolar (#4 and #13) has two cusps (buccal and lingual) and one root
Differences Between Second and First Maxillary Premolars

- The cusps are closer in length on the second premolar
- The lingual cusp is slightly shorter, but not as short as the cusp on the maxillary first premolar
- The mesiobuccal cusp slope is shorter than the distobuccal cusp slope on the second premolar
- The cusps of the secondary premolar are not as sharp as those of the maxillary first premolar
- The second premolar has only one root and one root canal
- The second premolar has a slight depression on the mesial root
- The second premolar is wider buccolingually than mesiodistally

Mandibular First Premolars

- Each mandibular first premolar (#21 and #28) has a long and well-formed buccal cusp and a small, nonfunctioning lingual cusp
- The lingual cusp may be no larger than the cingulum on some maxillary canines
- The mandibular first premolars are smaller and shorter than the mandibular second premolars

Views of a Permanent Mandibular Right First Premolar
Mandibular Second Premolars

- The permanent mandibular second premolars (#20 and #29) erupt distal to the mandibular first premolars
- They are the succedaneous replacements for the primary mandibular second molars
- There are two forms of the mandibular second premolar:
  - Three-cusp type, or tricuspidate form
  - Two-cusp type, or bicuspidate form

Views of a Permanent Mandibular Second Premolar

Occlusal Views of a Permanent Mandibular Second Premolar
Permanent Molars

- There are 12 molars, three in each quadrant, in the permanent dentition.
- The molar crowns have four or five short, blunt cusps, and each molar has two or three roots that help support the larger crown.

Permanent Molars (Cont.)

- The name molar comes from the Latin word for “grinding.”
- There are three types of molars: first, second, and third.
- The first and second molars are also called the 6-year and 12-year molars because of the approximate ages at which they erupt.

Maxillary Molars

- Usually the first permanent teeth to erupt into the maxillary arch.
- Each maxillary molar usually has four major cusps, with two on the buccal portion of the occlusal table and two on the lingual
- Each maxillary molar has three well-separated and well-developed roots.
- A tooth with three roots is said to be trifurcated, which means “divided into thirds.”
Clinical Considerations with Maxillary Molars

- The roots of the maxillary molars may penetrate the maxillary sinus as a result of accidental trauma or during an extraction.
- The permanent maxillary third molars may fail to erupt and may remain impacted within the alveolar bone.
- If the maxillary first molar is lost, the second molar can tip and drift into the open space, causing difficulty in chewing and furthering periodontal disease.

Maxillary First Molars

- The maxillary first molars (#3 and #14) are the first permanent teeth to erupt into the maxillary arch.
- They erupt distal to the primary maxillary second molars and are therefore nonsuccedaneous (do not replace the primary teeth).
- The maxillary first molar is the largest tooth in the maxillary arch and also has the largest crown in the permanent dentition.
- This molar is composed of five developmental lobes, two buccal and three lingual.
- The fifth cusp is called the cusp of Carabelli.

First Molars

- The roots of the maxillary molars may penetrate the maxillary sinus as a result of accidental trauma or during an extraction.
- The permanent maxillary third molars may fail to erupt and may remain impacted within the alveolar bone.
- If the maxillary first molar is lost, the second molar can tip and drift into the open space, causing difficulty in chewing and furthering periodontal disease.
Views of a Permanent Maxillary Right First Molar

Views of a Permanent Maxillary Right Second Molar

Maxillary Second Molars
- The crown of the maxillary second molar is somewhat shorter than that of the first molar, and it usually has four cusps
- No fifth cusp is present
- There are three roots
- The roots of the secondary molars are smaller than those of the first molars
  - The lingual root is still the largest and longest
Maxillary Third Molars

- The maxillary third molars (#1 and #16) differ considerably in size and contour.
- The crown of the maxillary third molar is smaller and the roots are usually shorter.
- The roots of the maxillary third molar tend to fuse, and the result is a single tapered root.
- People sometimes refer to the maxillary third molars as the "wisdom" teeth because they erupt last.

Buccal Views of Maxillary Right Molars

Views of Permanent Maxillary Right Third Molars
Mandibular Molars

- The mandibular molars erupt 6 months to 1 year before the corresponding permanent maxillary molars.
- The crowns of the mandibular molars have four or five major cusps, with two lingual cusps always of about the same width.
- All mandibular molars are wider mesiodistally than buccolingually, similar to anterior teeth.

Mandibular Molars (Cont.)

- Each mandibular molar has two well-developed roots, one mesial and one distal.
- A tooth with two roots is referred to as bifurcated, which means “divided into two.”
- A bifurcation is the area at which the two roots divide.

Clinical Considerations with Mandibular Molars

- The lingual inclination of the crowns of the mandibular molars can make it difficult to position the oral evacuator.
- The lingual inclination of the molar teeth can also pose problems in oral hygiene for patients, who may miss the lingual gingiva with the toothbrush.
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Mandibular First Molars

- The permanent mandibular first molars (#19 and #30) erupt between 6 and 7 years of age
- These teeth are commonly the first permanent teeth to erupt in the oral cavity
- The two roots, mesial and distal, of a mandibular first molar are larger and more divergent than those of a second molar

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Views of a Permanent Mandibular Right First Molar

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Mandibular Second Molars

- The mandibular second molars (#18 and #31) erupt between 11 and 12 years of age
- These teeth erupt distal to the permanent first molars and therefore are nonsuccedaneous
- The crown of the mandibular second molar is slightly smaller than that of the first molar in all directions
- The crown has four well-developed cusps
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Views of a Permanent Mandibular Right Second Molar

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Mandibular Third Molars

- The mandibular third molars (#17 and #32) are similar to the maxillary third molars in that they vary greatly in shape
- There is no typical mandibular third molar
- This molar is usually smaller in all dimensions than the second molar
- The third molar consists of four developmental lobes
- A mandibular third molar has two roots that are fused, irregularly curved, and shorter than those of a mandibular second molar

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Views of the Permanent Mandibular Right Third Molar
Buccal Views of Permanent Mandibular Right Molars

Learning Objectives
Lesson 12.3: Primary Dentition
4. Discuss the primary dentition, including the following:
   - Compare and contrast the features of the primary and permanent dentitions.
   - Describe the general and specific features of the primary dentition.
   - Discuss clinical considerations of the primary dentition.

Primary Dentition
- There are 20 primary teeth: 10 in the maxillary arch and 10 in the mandibular arch
- Includes incisors, canines, and molars
- Numbered in the Universal Tooth Numbering System with the capital letters A through T
- Smaller overall and have whiter enamel than the permanent teeth do
- The crown of any primary tooth is short in relation to its total length
- The crowns are narrower at the cementoenamel junction (CEJ)
Primary Dentition (Cont.)

- The pulp chambers and pulp horns in primary teeth are relatively large compared with those of the permanent teeth
- There is a thick layer of dentin between the pulp chambers and the enamel, especially in the primary mandibular second molar
- The enamel layer is relatively thin

Clinical Considerations with Primary Teeth

- Often parents do not understand the importance of the primary teeth
- Primary teeth hold the eruption space for the permanent teeth
- Because the enamel and dentin are thinner in primary teeth, decay can travel quickly through the enamel to the pulp, possibly causing loss of the tooth
- Early dental health education and dental care are essential in keeping the primary dentition

Primary Incisors

- The crowns and roots of deciduous incisors are smaller than those of their permanent successors
- The roots are twice as long as the crowns and taper toward the apex
Primary Maxillary Central Incisors

- The crown of the primary maxillary central incisor (E and F) is wider mesiodistally than incisocervically
- It is the only tooth of either dentition with this crown dimension
- The primary maxillary incisors have no mamelons
- The cingulum and marginal ridges are more prominent than they are on the permanent successor, and the lingual fossa is deeper

Views of a Primary Maxillary Right Central Incisor

Primary Maxillary Lateral Incisors

- The crown of the primary maxillary lateral incisor (D and G) is similar to that of the central incisor but much smaller in all dimensions
- The incisal angles on the lateral incisor are also more rounded than on the central incisor
- The lateral root is longer in proportion to its crown, and its apex is sharper
Views of a Primary Maxillary Lateral Incisor

Primary Mandibular Central Incisors

- The crown of the primary mandibular incisor (O and P) resembles the primary mandibular lateral incisor more than it does its permanent central successor.
- The mandibular central incisor is extremely symmetric.
- It is also not as constricted at the CEJ as is the primary maxillary incisor.
- The lingual surface of the mandibular central incisors appears smooth and tapers toward the prominent cingulum.

Views of a Primary Mandibular Central Incisor
Primary Mandibular Lateral Incisors

- The crown of the primary lateral incisor (Q and N) is similar in form to that of the central incisor in the same arch but is wider and longer.
- The incisal edge of the mandibular lateral incisor slopes distally, and the distoincisal angle is more rounded.

Views of a Primary Mandibular Lateral Incisor

Primary Canines

- There are four primary canine teeth, two in each dental arch.
- Differ from the outline of their permanent successors in the following ways:
  - Maxillary canines:
    - The crown of the primary maxillary canine (C and H) has a relatively longer and sharper cusp than that of its permanent successor on eruption.
    - The mesial and distal outlines of the primary maxillary canine are rounder.
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Views of a Primary Maxillary Canine

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Primary Mandibular Canines

- The primary mandibular canine (M and R) resembles the primary maxillary canine, but this tooth is much smaller labiolingually.
- The distal cusp slope is much longer than the mesial cusp slope.
- The lingual surface of the primary mandibular canine is marked by a shallow lingual fossa.
- The primary mandibular canine (M and R) resembles the primary maxillary canine, although some dimensions are different.

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Views of a Primary Mandibular Canine
Primary Molars
- The primary dentition consists of a total of eight primary molars
- Each quadrant includes a first primary molar and a second primary molar
- Each molar crown is wider than it is tall
- The permanent premolars replace the primary molars when they are exfoliated

Primary Maxillary First Molars
- The crown of the primary maxillary first molar (B and I) does not resemble any other crown of either dentition
- The height of contour on the buccal surface is at the cervical third of the tooth; on the lingual side, it is at the middle third
- The primary maxillary molars have three roots, which are thinner and have greater flare than do those of the permanent maxillary first molar
- The lingual root is the longest and most divergent

Views of a Primary Maxillary First Molar
Primary Maxillary Second Molars

- The primary maxillary second molar (A and J) is larger than the primary maxillary first molar.
- Closely resembles the permanent maxillary first molar but is smaller in all dimensions.
- The second molar usually has a cusp of Carabelli, the minor fifth cusp.

Views of a Primary Maxillary Second Molar

Primary Mandibular First Molars

- The crown of the primary mandibular first molar (L and S) is unlike any other tooth of either dentition.
- The height of contour on the buccal surface is at the cervical third of the tooth; on the lingual side, it is at the middle third.
- Has four cusps; the mesial cusps are larger.
- Has two roots, which are positioned similarly to those of other primary and permanent mandibular molars.
Views of a Primary Mandibular First Molar

Views of a Primary Mandibular Second Molar

Mandibular Second Molars
- The primary mandibular second molar (K and T) is larger than the primary mandibular first molar.
- Most closely resembles in form the permanent mandibular first molar.
Questions?