牙體形態學
Dental morphology

Primary Dentition

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學習目標

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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8. 牙齒之萌出、排列與咬合
9. 牙體形態學與各牙科臨床科目之相關
10. 牙科人類學與演化發育之探討

參考資料

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Summary

The course of Dental Morphology provides the student with knowledge in the morphological characteristics of the teeth and related oral structures upon which a functional concept of intra-arch relationships may be based for the clinical application to patient assessment, diagnosis, treatment planning, and oral rehabilitation.

Section I. Background information

A. DEFINITIONS

Primary teeth are often called deciduous [dee SIJ.oo es] teeth. Deciduous comes from the Latin word meaning to fall off. Deciduous teeth fall off or are shed (like leaves from a deciduous tree) and are replaced by the adult teeth that succeed them. Common nicknames for them are "milk teeth," or "temporary teeth," which, unfortunately, denote a lack of importance. The dentition that follows the primary teeth may be called the permanent dentition, but since many of the so-called permanent teeth are lost due to disease, trauma, or other causes, the authors have chosen to call it the secondary dentition (or adult dentition). [There are millions of people in the United States who have lost all of their "permanent teeth" (are edentulous).]

Section I. Background information

B. DENTAL FORMULAE

As stated in Chapter 1, the number and type of primary teeth in each half of the mouth is represented by this formula:

$$\text{Incisors } \frac{2}{2} \quad \text{Canines } \frac{1}{1} \quad \text{Molars } \frac{2}{2} = \frac{\text{5 maxillary teeth per side}}{\text{5 mandibular teeth per side}}$$

Compare this formula to that for the secondary dentition, and you will be able to draw some interesting conclusions:

$$\text{Incisors } \frac{2}{2} \quad \text{Canines } \frac{1}{1} \quad \text{Premolars } \frac{2}{2} \quad \text{Molars } \frac{3}{3} = \frac{\text{8 maxillary teeth per side}}{\text{8 mandibular teeth per side}}$$

Section I. Background information

C. FUNCTIONS OF THE PRIMARY DENTITION

Some parents do not consider the care of the primary teeth of their children to be a priority since they consider them as "temporary" or "baby" teeth, but it is important to remember that primary teeth are the only teeth that children have until approximately their sixth birthday, and some remain functioning until age 12. Primary teeth are actually in the mouth functioning for almost 6 years for mandibular central incisors to almost l0 years for maxillary canines [the average being 8 years for maxillary teeth and 7.6 years for mandibular teeth]. When people live to be 70 years of age, they will have spent 6% of their life chewing (masticating) solely with primary teeth. This small proportion of time should not infer a lack of importance of primary teeth, however, because they play a very important role in "reserving" space for the permanent teeth, which ensures proper alignment, spacing, and occlusion of the permanent teeth.

Section II. Developmental data for primary and secondary teeth

A. IMPORTANT TIMES FOR TOOTH EMERGENCE

Instead of memorizing the specific times of eruption of each tooth (which would be a daunting task), first consider this overview of the development of permanent and primary teeth based on their normal eruption patterns. If you learn the following time ranges, you will be well on your way to understanding the schedule of tooth eruption for both dentitions.

~ Birth-6 (or 8) months old: there are no teeth visible within the mouth.

A. IMPORTANT TIMES FOR TOOTH EMERGENCE

PRIMARY DENTITION ONLY

~ 6 (or 8) months-2 (or 2 1/2) old: all 20 primary teeth emerge into the child's mouth over this period.

~ 2 (or 2 1/2)-6 (or 5 3/4) years old: all primary teeth are present; no permanent teeth are yet visible in the mouth.

A. IMPORTANT TIMES FOR TOOTH EMERGENCE

MIXED DENTITION

~ 6 (or 5 1/2) years old: secondary teeth start to appear, beginning with the first molars (also called 6-year molars) just distal to the primary second molars. This is followed closely by the loss of the primary mandibular central incisors, which are quickly replaced by the secondary mandibular central incisors.

~ 6-9 years old: all eight secondary incisors replace primary incisors that are exfoliated (shed).

~ 9-12 years old: all eight premolars and four canines replace primary molars and canines.

~ 12 years old: second molars (also called 12-year molars) emerge distal to the permanent first molars.

ADULT DENTITION ONLY (after 12 years)

~ 17-21 years old: third molars (if present) emerge.

Section II. Developmental data for primary and secondary teeth

B. CROWN AND ROOT DEVELOPMENT

With these basic time periods in mind, one must not forget that much more is taking place during the development of these teeth than just their eruption and/or exfoliation. Prior to eruption, tooth crowns are forming from lobes and are calcifying within the jawbones. After crown calcification is completed, the tooth root starts to form, which results in the movement of the tooth through bone toward the surface (eruption process) and eventually through the oral mucosa into the oral cavity (emergence). After emergence, the root continues to form until root formation is completed.

B. CROWN AND ROOT DEVELOPMENT

1. CROWN CALCIFICATION OF PRIMARY TEETH

The crowns of all 20 primary teeth begin to calcify between 4 and 6 months in utero (seen developing in Fig. 10-4). Crown completion of all primary teeth occurs within the first year after birth, taking an average of 10 months from the beginning of tooth calcification. [The time from beginning hard tissue formation until complete enamel calcification ranges from a minimum of 9 months for incisors to a maximum of 13 months for primary second molars.]

B. CROWN AND ROOT DEVELOPMENT

2. ROOT FORMATION AND EMERGENCE OF PRIMARY TEETH

Root formation for primary (and permanent) teeth begins immediately after the enamel on the crown is completely formed, and at this time, the tooth starts its occlusal movement toward the oral cavity. This tooth movement is called eruption. In the process of eruption, the primary tooth crowns finally emerge into the oral cavity from age 6 months to 2 years (24 months). [The time of emergence of primary teeth after crown calcification is complete ranges from about 3 months for mandibular central incisors to about 13 months after calcification for maxillary second molars.] The eruptive movement continues after emergence, until eventually the tooth comes into occlusion with teeth in the opposite arch. Even then these teeth continue to erupt to compensate for wear (attrition) on the incisal or occlusal surface and/or when there are no opposing teeth.

B. CROWN AND ROOT DEVELOPMENT

3. ORDER OF EMERGENCE OF PRIMARY TEETH (FROM 6 MONTHS TO ABOUT 2 YEARS OLO)

The sequence of emergence for primary teeth presented in Table 10-2 shows that the first primary teeth to emerge are the mandibular central incisors, at about 6 months of age, followed by the mandibular laterals and then the maxillary incisors (centrals before laterals). (Note the difference in eruption patterns in Table 10-IB, where data showed that mandibular central incisors emerge first, but are followed by maxillary central incisors, maxillary lateral incisors, and finally mandibular lateral incisors.) Next to emerge are the first molars, canines, then second molars. Thus, the last primary teeth to emerge, thereby completing the primary dentition, are the maxillary second molars, at about 2 years (24 months) of age.

B. CROWN AND ROOT DEVELOPMENT

4. ROOT COMPLETION OF PRIMARY TEETH

The primary tooth roots are completed between the ages of 11/2 to 3 years. [The time from tooth emergence until the completion of the root ranges from about 10.5 months for maxillary central incisors to about 21 months for upper canines.] The complete primary dentition (with 20 teeth) is in the mouth from about 2 years of age to 5 1/2 or 6 years, during which no permanent teeth are present.

B. CROWN AND ROOT DEVELOPMENT

5. EXFOLIATION (SHEDDING) OF PRIMARY TEETH WITH THE SIMULTANEOUS ERUPTION AND EVENTUAL EMERGENCE OF THE SECONDARY (ADULT) TEETH

The roots of primary teeth are complete for a short period of time (as seen in Fig. 10-5). Only about 3 years after completion, primary tooth roots begin to resorb, usually at the apex or on one side near the apex. resorption of the primary tooth root occurs as the crown of the succedaneous tooth that is to replace it begins its occlusal migration, thus infringing upon the primary root. Increasing loss of root attachment from root resorption results in the eventual loosening of the deciduous teeth so they "fall off' the jaw. This process of shedding is called exfoliation. As the primary teeth are shed, the crowns of the succedaneous teeth are close to the surface, ready to emerge shortly (as seen in Fig. 10-6).

B. CROWN AND ROOT DEVELOPMENT

6. MIXED DENTITION (PRESENT FROM 5 1/4 OR 6 YEARS TO 12 YEARS OLD)

During the time when both primary and secondary teeth are present in the mouth, the dentition is known as a mixed dentition. The mixed dentition begins at age 5V, or 6 years old when the first (6-year) molars emerge. Next, the first primary incisors are gradually replaced by their larger successors. The mixed dentition ends at about age 12 when all primary teeth have been replaced. Usually, 24 teeth are seen in the mouth throughout the mixed dentition (all 20 primary teeth OR their successors, plus the four 6-year first molars). At 12 years old, all succedaneous teeth have replaced their primary predecessors (marking the end of mixed dentition). When the 12-year second molars erupt, 28 teeth are present.

B. CROWN AND ROOT DEVELOPMENT

7. CROWN FORMATION OF SECONDARY TEETH

The first secondary tooth crowns to begin forming (at birth) are the first molars. Crowns of the secondary dentition continue to form up to age 16 when crowns of third molars are completed. On average for the adult dentition, there is a 3- to 4-year span from completion of crown calcification until the tooth emerges into the mouth [with a range of from 2.7 years for the lower anterior teeth to 4.7 years for the lower posterior teeth].

B. CROWN AND ROOT DEVELOPMENT

8. ORDER OF EMERGENCE FOR SECONDARY TEETH

Table 10-4 includes the sequence of emergence for secondary teeth. After the 6-year molars erupt just prior to the child's sixth birthday, the order of emergence for the succedaneous teeth is essentially the same as for the order of exfoliation of the primary teeth they replace. If you know the time range (for emergence of incisors, or for canines and premolars) and sequence of eruption within that time range, you can estimate the emergence time for any succedaneous tooth.

Section III. Definition traits of all primary teeth

General Traits of All Primary Teeth Compared to Secondary Teeth

First, consider the general traits of all primary teeth that set them apart from the secondary teeth:

~ Primary teeth are smaller in size than the analogous secondary teeth (that is, primary incisors and canines are smaller than secondary incisors and canines, respectively, and primary first and second molars are smaller than secondary first and second molars, respectively).

~ Primary teeth are whiter in color.

~ The crowns and roots of primary teeth have a marked constriction at the cervix, appearing as if they are being squeezed with a rubber band. Thus, the enamel (especially on the facial and lingual surfaces) seems to bulge close to the cervical line forming labial cervical ridges and lingual cingulae rather than gradually tapering toward the occlusal surface as in secondary teeth. This is seen best from the proximal view in Appendix 9a and Appendix 10e.

Traits of All Primary Anterior Teeth

Next, consider the unique traits of the primary anterior teeth (refer to Appendix page 9 while studying these traits):

~ The cervical ridges on facial surfaces are prominent (running mesiodistally in the cervical third) (Appendix 9a, facial surfaces).

~ The lingual cingula are prominent or seem to bulge and occupy about one-third of the cervicoincisal length (Appendix 9a, lingual surfaces).

~ Usually, there are no depressions, mamelons, or perikymata on the labial surface of the crowns of the primary incisors. These surfaces are smoother than their successors.

Root Traits of Primary Anterior Teeth

~ The roots of primary anterior teeth are long in proportion to crown length (Appendix 9f) and are relatively narrow mesiodistally (Appendix 9b).

~ The roots of primary anterior teeth bend labially in their apical one-third to one-half by as much as 10 (Appendix 9c).

Traits of All Primary Posterior Teeth

Now consider the unique traits of the primary posterior teeth (refer to Appendix page 10 while studying these traits):

~ The prominent mesial cervical ridge or bulge on the buccal surface is exaggerated by the curve of the cervical line apically (best seen when viewed from the buccal) and by the constriction at the cervical line (best viewed from the proximal, Appendix 10e). This mesial cervical bulge makes it easy to distinguish rights from lefts.

~ Due to the taper of the crown from the cervical bulges toward the occlusal surface, the molar crowns have a narrow occlusal table (Appendix 10c). (The occlusal table is the chewing surface inside the line formed by the continuous mesial and distal cusp ridges for all cusps and the mesial and distal marginal ridges). In other words, the occlusal table is considerably smaller than the entire outline of the tooth from the occlusal view.

Root Traits of Primary Posterior Teeth

~ The root furcations are near the crown, with little or no root trunk (Appendix 10f).

~ The roots are thin and slender, and spread beyond the outlines of the crown, more widely on primary second molars than the first molars (the opposite of the adult molars) (Appendix 10g). This root divergence makes room for the development of the succedaneous premolars. Extraction of a deciduous molar when roots are complete and before they have started to resorb may cause the developing portion of the premolar to be removed along with the deciduous molar.

~ The roots of the primary molars are similar to those of the secondary molars in relative size and number. Primary maxillary molars have three roots (mesiobuccal, distobuccal, and palatal), while primary mandibular molars have two roots (mesial and distal).

Section IV. Class and type traits of primary teeth

A. PRIMARY INCISOR TRAITS

1. PRIMARY INCISORS FROM THE LABIAL VIEW

a. Outline Shape of Primary Incisor Crowns from the Labial View

Incisal edges of primary maxillary central incisors are relatively straight except for some rounding at the distoincisal angle. Mesial sides of maxillary central incisor crowns are fairly flat, whereas the distal sides are more convex. The crowns of primary maxillary central incisors are the ONLY incisor crowns (primary or secondary) that are wider mesiodistally than they are long incisocervically (Appendix 9e).

The maxillary lateral incisor crowns are similar in shape to the central incisor, but are longer incisocervically than wide mesiodistally, and are less symmetrical. Distoincisal angles of lateral incisors are even more rounded. Note this difference between the shapes of primary maxillary incisors in Figures 10-8 and 10-9. Laterals are smaller than central incisors in the same dentition.

The crowns of the mandibular incisors resemble their replacement incisor crowns, but are much smaller. As with secondary mandibular incisors, primary mandibular lateral incisor crowns are a little larger than the crowns of central incisors and less symmetrical (with more rounded distoincisal angles) than the central incisors of the same dentition (Fig. 10-8).

The locations of proximal contact areas on primary incisors are comparable to those of their successors.

1. PRIMARY INCISORS FROM THE LABIAL VIEW

b. Surface Morphology of Primary Incisors from the Labial View

Labial surfaces of maxillary central incisors are smooth; usually there are no depressions. Mandibular incisors are also relatively smooth but may have shallow depressions on their labial surfaces in the incisal third.

1. PRIMARY INCISORS FROM THE LABIAL VIEW

c. Root-to-Crown Proportion of Primary Incisors from the Labial View

Prior to root resorption, primary incisor roots are much longer relative to the crown length than on secondary incisors (Appendix 9f). Primary incisor roots are about twice the length of the crown. The roots of maxillary lateral incisors appear proportionally even longer. On primary extracted or shed teeth, there is usually some root resorption (evident in Fig. l0-9B). Often the entire root is gone.

2. PRIMARY INCISORS FROM THE LINGUAL VIEW

Refer to Figure 10-10.

a. Cingula of Primary Incisors from the Lingual View

The cingula of primary maxillary central incisors are often proportionally large, so that lingual fossae are in only the incisal and middle thirds of the lingual surface. The lingual surface of mandibular incisors also has a cingulum and a slight lingual fossa.

2. PRIMARY INCISORS FROM THE LINGUAL VIEW

b. Marginal Ridges of Primary Incisors From the Lingual View

On maxillary central incisors, marginal ridges are often distinct and prominent (like shovel-shaped incisors). On mandibular incisors, marginal ridges are more faint (Fig. 10-10).

3. PRIMARY INCISORS FROM THE PROXIMALVIEWS (MESIALAND DISTAL)

a. Primary Incisor Crown Outlines from the Proximal Views

Although the faciolingual dimension of these crowns appears small from these aspects, crowns are wide labiolingually in their cervical one-third because of prominent, convex labial cervical ridges and lingual cingula. Similar to their successors, incisal ridges of primary maxillary central incisors are located labial to the root axis line, whereas incisal ridges of mandibular incisors are located on the root axis line (Fig. 10-11).

3. PRIMARY INCISORS FROM THE PROXIMALVIEWS (MESIALAND DISTAL)

b. Cervical Line of Primary Incisors from the Proximal Views

As on secondary incisors, the curve of the cervical line toward the incisal is greater on the mesial than on the distal. The cervical line is positioned more apically on the lingual than on the labial side.

3. PRIMARY INCISORS FROM THE PROXIMALVIEWS (MESIALAND DISTAL)

c. Root Shape of Primary Incisors from the Proximal Views

The roots of maxillary incisors are curved from this view, bending lingually in the cervical third to half (Appendix 9d), and labially by as much as 10º in the apical half (Appendix 9c). Roots of the mandibular incisors, in contrast, are straight in their cervical half, but then bend labially about 10º in their apical half (Appendix 9c). This bend helps make space for the developing succedaneous incisors, which should be in a lingual and apical position.

4. PRIMARY INCISORS FROM THE INCISAL IEW

Incisor crowns have a smoothly convex labial outline. The 1-mm thick incisal ridge is slightly curved mesiodistally. The crowns have lingual surfaces that become narrower toward the lingual, at the cingulum. Crowns of primary maxillary central incisors are much wider mesiodistally than faciolingually [by 2.4 mm] compared to maxillary lateral incisors, which are only 0.9 mm wider mesiodistally. These proportions are evident in Figure 10-12. Both mandibular incisor crowns have mesiodistal and faciolingual dimensions that are essentially equal.

B. PRIMARY CANINE TRAITS

1. PRIMARY CANINES FROM THE LABIAL VIEW

a. Outline Shape of Primary Canines from the Labial View

Maxillary canine crowns may be as wide as they are long. They are constricted at the cervix. They have convex mesial and distal outlines, with distal contours more broadly rounded than mesial contours, which are somewhat angular (Fig. 10-13). Mandibular canine crowns are longer incisocervically than wide mesiodistally [by 2.1 mm] and are 1.3 mm narrower mesiodistally than maxillary canine crowns (Appendix 9g).

a. Outline Shape of Primary Canines from the Labial View

1. Cusp Ridge Outlines

Maxillary canine cusps are often very sharp (pointed) with two cusp ridges meeting at an acute angle. The mesial cusp ridges of these maxillary canines are UNIQUE in that they are longer than the distal cusp ridges (similar to only the secondary maxillary first premolars, but just the opposite of all other premolars and canines, secondary and primary) (Appendix 9h, maxillary canine, and Fig. 10-13B). These mesial cusp ridges are flat to concave and less steeply inclined than the shorter distal ridges, which are more convex. Mandibular canines have sharp cusp tips pointed like an arrow (Fig. 10-13A). As on the secondary mandibular canines, the mesial cusp slope is shorter than the distal cusp slope (Appendix 9h, mandibular canine).

a. Outline Shape of Primary Canines from the Labial View

2. Contact Areas

Distal contact areas of primary canines rest against the mesial surfaces of primary first molars since there are no primary premolars. Mesial and distal contact areas of primary maxillary canines are near the center of the crown cervicoincisally, with the mesial contact more cervically located (a condition UNIQUE to this tooth and the mandibular first premolar) (Appendix 9i).

b. Cervical Lines of Primary Canines from the Labial View

Cervical lines on maxillary canines are nearly flat on the labial surface.

c. Roots of Primary Canines from the Labial View

Maxillary canine roots prior to resorption are the longest of the primary teeth [13.5 mm] tapering to a blunt apex. The roots of mandibular canines are more tapered and pointed, and shorter than maxillary canine roots [by 1.8 mm].

2. PRIMARY CANINES FROM THE LINGUAL VIEW

The cingulum on a maxillary canine crown is bulky with well-developed mesial and distal marginal ridges that are, however, less prominent than on the secondary canines (Fig. 10-10). A lingual ridge, with an adjacent mesial and distal fossa, is located on a maxillary canine crown somewhat distal to the middle of the crown. Distal fossae on these teeth are narrower and deeper than mesial fossae, which are broader and shallower. In contrast, lingual ridges are barely discernible on mandibular canines, with faint marginal ridges and usually a single concavity or fossa (Fig. 10-10).

3. PRIMARY CANINES FROM THE PROXIMAL (MESIALAND DISTAL) VIEWS

a. Outline of Primary Canines from the Proximal Views

The cervical third of a primary canine is much thicker than on an incisor. On maxillary canines, cusp tips are positioned considerably labial to the root axis line (Fig. 10-11), whereas the cusp tip of mandibular canines is most often located slightly lingual to the root axis line. Labial cervical ridges are prominent on both maxillary and mandibular canines, bulging similar to lingual cingula. The S-shaped lingual crown outline of maxillary canines is more concave than on permanent canines.

3. PRIMARY CANINES FROM THE PROXIMAL (MESIALAND DISTAL) VIEWS

b. Cervical Lines of Primary Canines from the Proximal Views

Cervical lines of both maxillary and mandibular canines curve incisally more on the mesial side than on the distal side, just like all other anterior teeth. Like primary incisors, the cervical lines are positioned more apical on the lingual than on the labial.

3. PRIMARY CANINES FROM THE PROXIMAL (MESIALAND DISTAL) VIEWS

c. Roots of Primary Canines from the Proximal Views

The roots of both maxillary and mandibular canines are bulky in the cervical and middle thirds, tapering mostly in the apical third where the apex is bent labially, similar to primary central and lateral incisors (Appendix 9c and Fig. 10-11).

4. PRIMARY CANINES FROM THE INCISAL VIEW

a. Crown Outline of Primary Canines from the Incisal View

The crown outline of maxillary canines taper noticeably toward the cingulum, which is centered mesiodistally. The mesial half of these crowns is thicker faciolingually than the distal half (similar to secondary maxillary canines). From the incisal aspect, mandibular canine crowns have a diamond shape and are nearly symmetrical, except for the mesial position of the cusp tips, and they appear to have slightly more bulk in the distal half (Fig. 10-12). Cingula are centered or just distal to the center.

4. PRIMARY CANINES FROM THE INCISAL VIEW

b. Crown Proportions and Size of Primary Canines From the Incisal View

Primary maxillary canine crowns are broader faciolingually than incisor crowns, but are still wider mesiodistally than faciolingually [by 2 mm]. The 1.5-mm thick mesial and distal cusp ridges curve toward the lingual at both ends. Mandibular canine crowns are only slightly wider mesiodistally than faciolingually [by 0.4 mm]. The smallness of these teeth, compared to their replacement counterparts, is quite noticeable.

C. PRIMARY MOLAR TRAITS

As stated earlier, primary molar roots are thin and widely spread to make room for the developing premolar crowns that are forming beneath them (Fig. 10-14). Recall that primary first molars form over the crowns of developing first premolars and erupt just distal to primary canines and just mesial to primary second molars. Primary second molars form over the crowns of developing second premolars, just distal to primary first molars and, after age 6, just mesial to 6-year first molars. It could be said that these primary molars are saving a place in the arch for the teeth that will succeed them, namely, the first and second premolars, respectively.

C. PRIMARY MOLAR TRAITS

Primary second molars have considerable similarities to secondary first molars in their respective arches. Since these teeth are adjacent to one another during the time of mixed dentition (or longer in the case of retained primary teeth), it is important to distinguish between the primary second molars and the 6-year first molars that erupt just distal to them. One obvious difference between primary and secondary molar crowns is the presence of a prominent mesial cervical ridge on the buccal surface of primary molars. This bulge is sometimes called a buccal cingulum. Also, primary second molars are smaller than 6-year first molars in the same dentition. Tooth position from the midline is also an important clue for tooth identification. Primary second molars are normally the fifth tooth from the midline, whereas secondary first molars are sixth from the midline. The differences in size and position between the primary maxillary second molar and the secondary maxillary first molar are evident in Figures 10-15 and 10-16.

C. PRIMARY MOLAR TRAITS

PrImary first molars are more unique in their shape. One author feels that primary maxillary first molars are the most atypical of human molars, while another author feels that the crowns somewhat resemble premolars (from the occlusal view) It is agreed that primary mandibular first molars resemble no other tooth in either dentition.

C. PRIMARY MOLAR TRAITS

When considering arch traits of all primary molars, consider the number of roots. Primary maxillary molars generally have three roots (mesiobuccal, distobuccal, and palatal, as on secondary maxillary molars), whereas primary mandibular molars have only two roots (mesial and distal, as on secondary mandibular molars). Also, like secondary molars, maxillary primary molars tend to be wider buccolingually than mesiodistally, whereas mandibular molars tend to be wider mesiodistally than buccolingually. Compare the occlusal outlines of primary molars in the Appendix on page 10. Each type of primary molar will be discussed in detail at this time, emphasizing the traits that further differentiate each type. Discussion begins with primary second molars since they are similar to the secondary first (6-year) molars discussed previously in Chapter 7. 1.

TYPE TRAITS OF THE PRIMARY MAXILLARY SECOND MOLAR

Primary maxillary second molars resemble the 6-year (adult) maxillary first molars, which erupt just distal to them (as evident on the right side of the photograph in Fig. 10-15A), but are smaller [by 13.2% when all dimensions are averaged]. They are similar in most respects, with the cusp ridges and fossae corresponding to those of permanent first molars. Maxillary primary second molars may even have a cusp of Carabelli (Fig. 10-17B and C). Primary maxillary second molar crowns are wider [mesiodistally by 47%] than the maxillary second premolars that will replace them.

TYPE TRAITS OF THE PRIMARY MAXILLARY SECOND MOLAR

a. Crown Morphology of the Primary Maxillary Second Molar

Due to the prominent mesiobuccal cervical ridge and small occlusal table, these primary molars, when viewed from the proximal aspect (Fig. 10-18), appear to taper narrower considerably toward the occlusal (Appendix 10c and e). From the occlusal aspect, the crown also tapers considerably narrower from mesial to distal, accentuated by the prominent mesiobuccal bulge (seen in the Appendix page 10, occlusal view). Further, the mesiolingual corner of the occlusal surface is flattened as though it were compressed toward the distal5 (Appendix 10h), displacing the mesiolingual cusp more distally than on the permanent first molars. This results in more taper from buccal to lingual, an oblique ridge that is straighter in its course buccolingually, and a smaller, oblong distal fossa buccolingually (Fig. 10-17C). The mesiobuccal cusp is almost equal in size or slightly larger than the mesiolingual cusp (Appendix 10i). (Recall that the mesiolingual cusp is largest on permanent maxillary first molars.)

TYPE TRAITS OF THE PRIMARY MAXILLARY SECOND MOLAR

b. Roots of Primary Maxillary Second Molar

The three roots (mesiobuccal, distobuccal, and palatal) are thin and slender and widely spread apart, with the root furcation very close to the cervical line so there is very little root trunk.

2. TYPE TRAITS OF THE PRIMARY MANDIBULAR SECOND MOLAR

The primary mandibular second molars resemble the 6-year (adult) mandibular first molars, which erupt just distal to them (Fig. 10-16B), but are smaller [by 17.3% when all dimensions are averaged]. They are similar in most respects, with the cusp ridges and fossae corresponding to those of secondary first molars (Fig. 10-19). Primary mandibular second molar crowns are wider [mesiodistally by 45%] than the mandibular second premolars that will replace them.

2. TYPE TRAITS OF THE PRIMARY MANDIBULAR SECOND MOLAR

a. Crown Morphology of the Primary Mandibular Second Molar

Compared to secondary mandibular first molars, primary mandibular second molars have a more prominent mesial cervical ridge, the roots are more slender and more widely spread, and the three buccal cusps (mesiobuccal, distobuccal, and distal) are of nearly equal size (Appendix 10j). The middle buccal cusp (called the distobuccal) is the widest (largest). As on the 6-year mandibular molars, these cusps are separated by mesiobuccal and distobuccal grooves. The mesiolingual and distolingual cusps are about the same size and height, slightly shorter than the buccal cusps. A lingual groove separates these two lingual cusps.

a. Crown Morphology of the Primary Mandibular Second Molar

From the proximal views, the mesial marginal ridge of the primary mandibular second molar is high and is crossed by a groove that may extend about one-third of the way down the mesial surface. This mesial surface is generally convex but flattens cervically. The contact area with the primary first molar is in the shape of an inverted crescent just below the notch of the marginal ridge.

a. Crown Morphology of the Primary Mandibular Second Molar

Since the crown is shorter on the distal side and the distal marginal ridge is lower (more cervical) than the mesial marginal ridge, all five cusps can be seen from the distal aspect. The distal contact with the mesial side of the 6-year first molar is round in shape and is located just buccal and cervical to the distal marginal groove (furrow) (Fig. 10-19B). The cervical line is almost flat on both the mesial and distal sides of the crown but slopes occlusally toward the lingual.

2. TYPE TRAITS OF THE PRIMARY MANDIBULAR SECOND MOLAR

b. Roots of Primary Mandibular Second Molar

The two roots (mesial and distal) are thin and slender and widely spread apart, with the root furcation very close to the cervical line so there is very little root trunk. The roots are about twice as long as the crowns and are thin mesiodistally. The mesial root is broad and flat with a blunt apex, and has a shallow longitudinal depression. The distal root is broad and flat and is narrower and less blunt at the apex than the mesial root. The root furcation is very close to the cervical line with very little root trunk.

3. TYPE TRAITS OF THE PRIMARY MAXILLARY FIRST MOLAR

Primary maxillary first molars are quite unique in appearance (Fig. 10-20). According to one author, they do not resemble any other molars. According to another author, from the occlusal view they resemble maxillary first premolars that replace them (Appendix page 10, occlusal view).

3. TYPE TRAITS OF THE PRIMARY MAXILLARY FIRST MOLAR

The crowns are slightly wider than the premolars that will replace them [mesiodistally by 14%]. From the buccal aspect, these crowns appear very wide relative to their height, and are noticeably shorter occlusocervically toward the distal. The mesiobuccal cusp has a buccal ridge (running occlusocervically) that extends to the cervical line.

3. TYPE TRAITS OF THE PRIMARY MAXILLARY FIRST MOLAR

When the buccal surface is viewed from the proximal, the prominent mesial buccal cervical ridge and adjacent fiat buccal outline from cervical ridge toward the occlusal surface results in a considerable taper from the wide cervical third to the narrow occlusal third (Appendix 10c and e, proximal views). The lingual outline from the proximal view is more gradually convex in the cervical and middle third and fiat in the occlusal third.

3. TYPE TRAITS OF THE PRIMARY MAXILLARY FIRST MOLAR

a. Crown Morphology of Primary Maxillary First Molars

The occlusal outline is basically rectangular (wider faciolingually than mesiodistally [by 1.4 mm]) (Appendix 10m and Fig. 10-21, teeth B and I). Further, the prominent mesiobuccal cervical ridge (running mesiodistally in the cervical third) results in a wider dimension buccolingually in the mesial half, and a taper toward the distal. This tooth also tapers toward the lingual due to the mesial marginal ridge, which does not run straight toward the lingual, but rather runs obliquely in a distolingual direction. This taper is similar to that on the mesiolingual corner in the primary maxillary second molar (Appendix 10n). In contrast, the distal marginal ridge runs in a straight direction buccolingually, joining both the buccal and lingual borders at right angles, best seen in Figure 10-20, occlusal view.

a. Crown Morphology of Primary Maxillary First Molars

The mesial contact is fiat where it contacts the canine in the occlusal third. The distal crown outline is decidedly more convex than the mesial, and contacts the primary second molar in the middle third.

a. Crown Morphology of Primary Maxillary First Molars

Primary maxillary first molars, like secondary maxillary molars, usually have four cusps, but they may appear somewhat like maxillary premolars from the occlusal view since they have only two prominent cusps (a wide mesiobuccal cusp and a narrower, slightly more distinct, mesiolingual cusp). The other two cusps, the distobuccal and distolingual, are relatively indistinct and may blend into the distal marginal ridge. When a distolingual cusp is present (four-cusp type), it is inconspicuous and it is often only a small nodule on the lingual half of the distal marginal ridge. Sometimes, the distolingual cusp is absent (three-cusp type), and the triangular ridge of the narrow distobuccal cusp actually becomes the distal marginal ridge.

a. Crown Morphology of Primary Maxillary First Molars

The mesiobuccal cusp is the longest (but second sharpest) cusp. The mesiolingual cusp is the second longest, but sharpest, cusp. In the four-cusp type, the triangular ridges of the distobuccal cusp join the more distal of the two triangular ridges from the mesiolingual cusp as a barely discernible transverse ridge. There is no buccal groove on the buccal surface, just a slight notch that divides the large mesiobuccal cusp from the indistinct distobuccal cusp (Appendix 101). This notch is distal to center. A groove between the two lingual cusps is present only when the distolingual cusp is definite.

a. Crown Morphology of Primary Maxillary First Molars

There are three fossae on these maxillary first molars: a medium-size central fossa, a large and deep mesial triangular fossa, and a minute distal triangular fossa, each with a pit: central, mesial, and distal, respectively (Appendix 10o).

a. Crown Morphology of Primary Maxillary First Molars

The occlusal grooves of the four-cusp type primary maxillary first molar teeth usually form an "H" pattern (seen in Fig. 10-20). The crossbar of the "H" is the central groove that connects the central and mesial triangular fossae. [Some textbooks say there is no central groove and that the crossbar is made up of a mesial and distal groove instead] Supplemental grooves running buccolingually just inside of the mesial marginal ridge form the mesial side of the "H," and the buccal groove (dividing the buccal cusps) combined with the distolingual groove (between the large mesiolingual and minute distolingual cusps on four-cusp type molars only) form the distal side of the "H." The mesial marginal ridge may be crossed by a marginal groove.

3. TYPE TRAITS OF THE PRIMARY MAXILLARY FIRST MOLAR

b. Roots of Primary Maxillary First Molar

The three roots (mesiobuccal, distobuccal, and palatal) are thin and slender and widely spread apart, with the root furcation very close to the cervical line so there is very little root trunk (Appendix 10f).

4. TYPE TRAITS OF THE PRIMARY MANDIBULAR FIRST MOLARS

These mandibular first molars do not resemble any other primary or secondary tooth (Fig. 10-21, teeth L and S, and Fig. 10-22). According to one author, the chief differentiating characteristic may be an overdeveloped mesial marginal ridge (Appendix 10q). The mesial marginal ridge is so well developed that it resembles a cusp. This longer, prominent mesial marginal ridge is positioned more occlusally than the short (buccolingual), less prominent distal marginal ridge. (Compare mesial and distal views in Fig. 10-18 for marginal ridge heights and lengths.) Primary mandibular first molar crowns are wider [mesiodistally by 24%] than the mandibular first premolars that will replace them.

4. TYPE TRAITS OF THE PRIMARY MANDIBULAR FIRST MOLARS

a. Crown Morphology of the Primary Mandibular First Molar

From the facial (and lingual) views, the crowns of these first molars are wider mesiodistally than high cervico-occlusally [by 1.6 mm] (Fig. 10-22A). Facially, they are longer (occlusocervically) on the mesial, due in part to the slope of the cervical line gingivally toward the mesial, separating the very prominent mesiobuccal cervical ridge from the root, and also due to the cervical slope of the occlusal border from mesial to distal. The mesial contact area with the canine is located more cervically than the distal contact area, which is in the middle of the crown.

a. Crown Morphology of the Primary Mandibular First Molar

The cervical line on the mesial, although it arcs toward the occlusal, also slopes gingivally toward the buccal (where the mesiobuccal cervical ridge meets the root, Fig. 10-22B). On the distal or lingual surface, the cervical line is practically fiat or horizontal from buccal to lingual or from mesial to distal, respectively. Recall that the crowns of all mandibular posterior teeth, primary and secondary, appear to lean lingually, even more so with primary teeth. This primary mandibular first molar crown appears to lean decidedly toward the lingual (accentuated by the prominent mesiobuccal cervical ridge), placing the buccal cusp tips well over the root base.6 The lingual cusp tip may even be outside the lingual margin of the root (Fig. 10-22B). From the proximal views, the buccal crown contour is nearly (but not quite) fiat from the buccal crest of curvature to the occlusal surface and cervico-occlusally. The lingual surface is more convex cervico-occlusally.

a. Crown Morphology of the Primary Mandibular First Molar

The general shape of the entire occlusal outline is somewhat oval or rectangular (wider mesiodistally than buccolingually, as seen in Figs. 10-21 and 10-22C). As with the primary maxillary molars, these teeth taper narrower toward the lingual but do so primarily due to the taper of the mesial surface (Appendix 10s), and not of the distal side. Subsequently, the mesiobuccal angle is acute, whereas the distobuccal angle is obtuse. The mesial crown contour is nearly fiat buccolingually, whereas the distal surface is convex; the lingual surface is convex mesiodistally.

a. Crown Morphology of the Primary Mandibular First Molar

The shape of the occlusal table is wider mesiodistally than buccolingually (Appendix 10r).There is a prominent transverse ridge between the mesiobuccal and mesiolingual cusps (Appendix 10u and Fig. 10-21, teeth L and S). Even though the entire tooth outline from the occlusal view appears to be wider on the mesial half due to the prominent mesial cervical ridge, the occlusal table width distal to the transverse ridge is larger than that portion mesial to the transverse ridge (Appendix 10v). Subsequently, the mesial triangular fossa and pit are relatively small, and the distal fossa is larger, extending almost into the center of the occlusal surfaces (Appendix 10v). In the large distal fossa, there is a central pit and a small distal pit near the distal marginal ridge. There is no central fossa.

a. Crown Morphology of the Primary Mandibular First Molar

This tooth has four cusps. The cusps are often difficult to distinguish, but careful examination of an unworn tooth will reveal (in order of diminishing size) a mesiobuccal, mesiolingual, distobuccal, and the smallest (also shortest) distolingual cusp. The mesiobuccal cusp of the mandibular first molar is always the largest and longest cusp, occupying nearly two-thirds of the buccal surface (Appendix 10t; Fig. 10-22A). This cusp is characteristically compressed buccolingually, and its two long cusp ridges extend mesially and distally, serving as a blade when occluding with the maxillary canine. The smaller distobuccal cusp is separated from the mesiobuccal cusp by a depression rather than a distinct groove. The mesiolingual cusp is larger, longer, and sharper than the distolingual cusp, and there is a slight groove between these two lingual cusps that ends in a depression near the cervix of the crown. The distal spur of the distolingual cusp forms the lingual third of the distal marginal ridge ending in a furrow.

a. Crown Morphology of the Primary Mandibular First Molar

A central groove separates the mesiobuccal and mesiolingual cusps and connects with a mesial marginal groove (furrow). There is a short buccal groove and a short lingual groove on the occlusal surface. The buccal groove does not extend onto the buccal surface, and the lingual groove becomes a shallow depression on the lingual surface. Both marginal ridges have furrows or grooves between them and cusp ridges of lingual cusps6 similar to the supplemental grooves in the triangular fossae of other posterior teeth. These grooves serve as escape ways during mastication.

4. TYPE TRAITS OF THE PRIMARY MANDIBULAR FIRST MOLARS

b. Roots of Primary Mandibular First Molars

The two roots (mesial and distal) are thin and slender and widely spread apart, with the root furcation very close to the cervical line, so there is very little root trunk (Appendix 10f). The mesial root is wider (square and fiat) and longer than the distal root. The distal root is more rounded, less broad, thinner, and shorter than the mesial root.

Section V. Pulp cavity of primary teeth

Primary anterior teeth have pulp cavities that are similar in shape to the pulp cavities of the secondary teeth, but are much larger in proportion because of the thinner, more uniform enamel covering, and the thinner portion of dentin in the deciduous teeth. On anterior primary teeth, there are slight projections on the incisal border corresponding to the lobes, and there is usually no demarcation or constriction between the single canal and pulp chamber except on the mandibular central incisor. Primary molar teeth, when compared with secondary molars, have pulp chambers much less elongated vertically relative to the size of the tooth. In primary molars there is little or almost no root trunk, so the pulp chambers are mostly in the tooth crown (Fig. 10-23A).

Section V. Pulp cavity of primary teeth

Compare this to secondary molars, where much of the pulp chamber is located in the root trunk. The pulp chambers of primary molars have long and often very narrow pulp horns extending beneath the cusps. The mesiobuccal pulp horn (and cusp) of the primary maxillary second molar is longest in that tooth, compared to the mesiolingual horn (and cusp) in the secondary maxillary first molar. Great care must be taken when preparing primary teeth for restorations to avoid cutting into (exposing) the pulp horns during cavity preparation (Fig. l0-23B).