CHAPTER 2

Morphology of the Permanent Incisors

Topics covered within the six sections of this chapter include the following:

I. General description of incisors
- **A.** Location of incisors in the mouth
- **B.** Functions of incisors
- **C.** Studying tooth morphology

II. Class traits that apply to most incisors
- **A.** Class traits of most incisors from the facial view
- **B.** Class traits of most incisors from the lingual view
- **C.** Class traits of most incisors from the proximal views
- **D.** Class traits of most incisors from the incisal view

III. Arch traits that differentiate *mandibular* from *maxillary* incisors
- **A.** Mandibular incisors are smaller and look more alike
- **B.** Contacts positioned more incisally on mandibular incisors
- **C.** Mandibular incisor crowns are wider faciolingually
- **D.** Maxillary incisors have prominent lingual anatomy
- **E.** Mandibular incisor roots are relatively longer
- **F.** Mandibular incisal ridges are more lingual
- **G.** Incisal edge wears labially on mandibular incisors

IV. Type traits that differentiate maxillary *central* from *lateral* incisors (from all views)
- **A.** Type traits of maxillary incisors from the labial view
- **B.** Type traits of maxillary incisors from the lingual view
- **C.** Type traits of maxillary incisors from the proximal views
- **D.** Type traits of maxillary incisors from the incisal view

V. Type traits that differentiate mandibular *central* from *lateral* incisors (from all views)
- **A.** Type traits of mandibular incisors from the labial view
- **B.** Type traits of mandibular incisors from the lingual view
- **C.** Type traits of mandibular incisors from the proximal views
- **D.** Type traits of Mandibular incisors from the incisal view

VI. Interesting variations and ethnic differences in incisors

Chapter 2 focuses on class traits and type traits of permanent incisors. The authors recommend that you copy Appendix pages 1 and 2 (front and back pages) located at the end of this book, or print out these pages from the online source thePoint® provided for this book, to facilitate study and minimize page turns as you read this chapter. On page 1 of the Appendix, the maxillary right lateral incisor is used as a representative example for all incisors when listing incisor class traits, but be aware that there may be exceptions to the common incisor traits presented here, and these are emphasized with capital letters ("EXCEPT"). Appendix page 2 includes arch and type traits that differentiate all four types of incisors.

As you read this chapter, the word "Appendix" followed by a number and letter (e.g., Appendix 1a) is used to denote the appendix page (page 1) and trait being referenced (trait a). Notice that the trait being summarized after each letter on an appendix page is summarized on the back of that Appendix page. As you study the traits of each type of human tooth, be aware that these traits can vary considerably from mouth to mouth just as facial features vary considerably from one person to another. One study of a collection of 100 maxillary central incisors showed considerable difference in such characteristics as size, relative proportions, and color.[1]

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It would be ideal if you could learn the similarities and differences of all incisors while comparing models or extracted specimens of all four types of incisors from the views indicated. Remember when studying the *maxillary* incisors to hold them with their crowns down and roots up. For *mandibular* incisors, hold the crowns up and the roots down. In this manner, the teeth will be oriented as they were in the mouth.

Finally, the statistics from Dr. Woelfel's original research that were used to draw conclusions throughout this chapter are referenced with superscript letters like this (data[A,B, etc.]) and refer to data presented at the end of this chapter.

SECTION I GENERAL DESCRIPTION OF INCISORS

OBJECTIVES FOR SECTIONS I, II, AND III

These sections are designed to prepare the learner to perform the following:

- Describe the location of incisors in the mouth.
- Describe the functions of incisors.
- List class traits common to all incisors.
- List arch traits that can be used to distinguish maxillary from mandibular incisors.
- From a selection of all teeth, select and separate out the incisors (using class traits).
- Divide a selection of all incisors into maxillary and mandibular (using arch traits).

A. LOCATION OF INCISORS IN THE MOUTH

Refer to *Figure 2-1* or, better yet, to a model of the complete set of permanent teeth while becoming familiar with the location and Universal number of each incisor. There are four maxillary incisors: two central incisors (Universal numbers 8 and 9) and two lateral incisors (7 and 10). There are four mandibular incisors: two central incisors (teeth 24 and 25) and two lateral incisors (23 and 26).

Central incisors are located on either side of their respective arch (maxillary or mandibular) with their mesial surfaces next to one another at the midline, normally in contact. Their distal surfaces contact the mesial surfaces of the adjacent lateral incisors. **Lateral incisors** are therefore just distal to central incisors, with their mesial surfaces in contact with the distal surfaces of the adjacent central incisors. Their distal surfaces contact the mesial surfaces of the adjacent canines. Incisors in the mouth are identified with Universal numbers in *Figure 2-2*.

B. FUNCTIONS OF INCISORS

Mandibular incisors function with the maxillary incisors to (a) cut food (mandibular incisors are moving blades against the maxillary incisors), (b) enable articulate speech (consider the enunciation of a toothless person), and (c) help to support the lip and maintain an esthetic appearance. By current standards, a person lacking one or more incisors has an undesirable appearance (*Fig. 2-3*). (Did you ever hear the song "All I want for Christmas are my two front teeth"?) Their fourth function, by fitting the incisal edges of the mandibular incisors against the lingual surfaces of the maxillary incisors, is to (d) help guide the mandible posteriorly during the final phase of closing just before the posterior teeth contact.

LEARNING EXERCISE

Begin with your front teeth touching together edge to edge, and then begin to close your back teeth together. If you have ideal occlusion, when you move posteriorly, you should feel your upper incisors touching (and guiding) your mandibular incisors as your mandible moves posteriorly and your teeth close together.

C. STUDYING TOOTH MORPHOLOGY

The morphology or anatomy of incisors can best be studied by considering the unique shape and specific contours of each type of incisor. When discussing traits, the external morphology of an incisor is usually described from each of five views: (a) facial (or labial), (b) lingual (tongue side), (c) mesial, (d) distal, and (e) incisal. Due to similarities between the mesial and distal, these surfaces will be discussed together in this text under the heading of proximal surfaces. The shape (outline) and commonly occurring contours (ridges, grooves, convexities, and concavities) on each tooth surface should be memorized so you can describe and identify teeth by arch, class, type, and side of the mouth; reproduce tooth contours when constructing crowns, bridges, and fillings; skillfully remove deposits (tartar and calculus) from all contours of crowns and roots; or finish and polish existing restorations.

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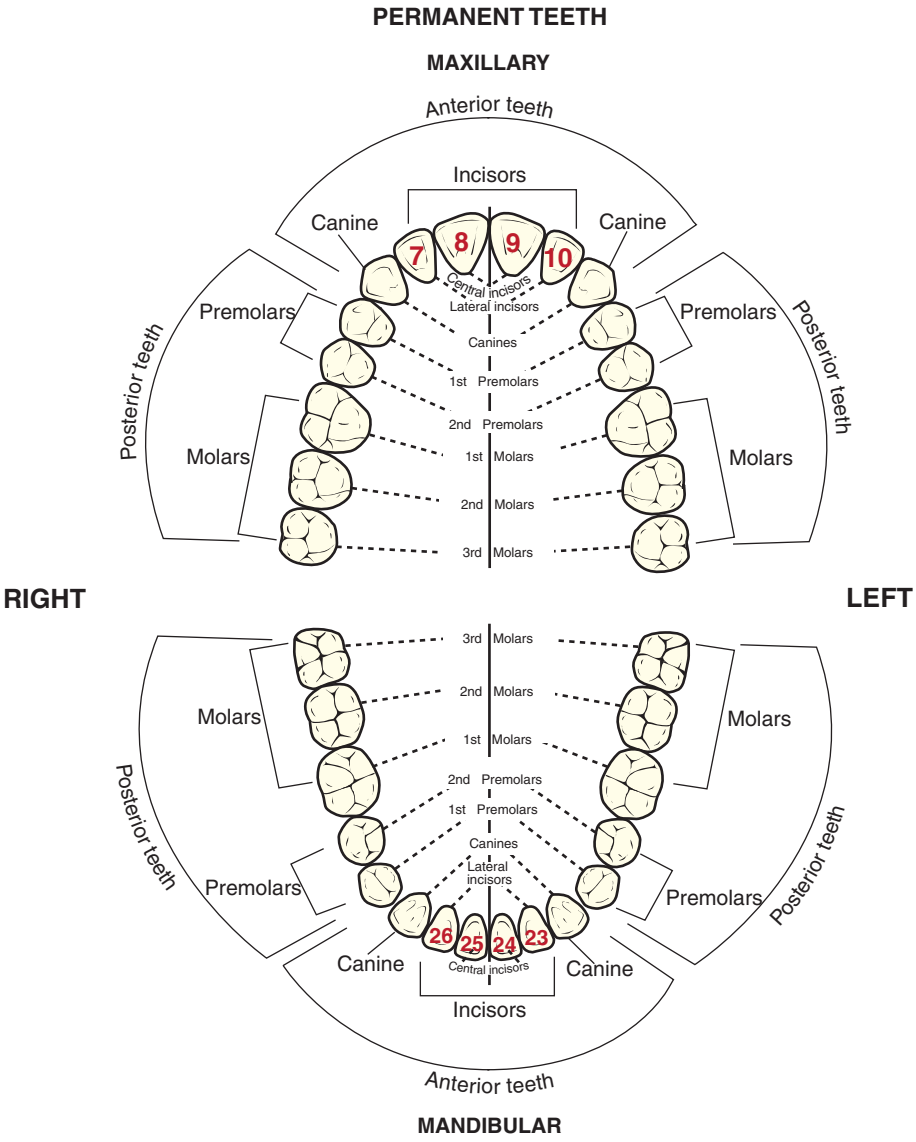


FIGURE 2-1. Adult dentition with **Universal numbers** on the **incisors** highlighted in *red*.



FIGURE 2-2. **Relative size and shape** of incisors in the mouth show that maxillary central incisors are the widest, followed by maxillary laterals, then mandibular laterals, and, finally, the narrowest teeth in the mouth, the mandibular central incisors.



FIGURE 2-3. Missing anterior teeth greatly affect an esthetic smile.

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SECTION II CLASS TRAITS THAT APPLY TO MOST INCISORS

First, consider the **class traits** of incisors, that is, traits that apply to most incisors.

Developmental lobes: Recall from Chapter 1 that the *facial* surface of all anterior teeth forms from three labial lobes: the mesial, middle, and distal lobes. The facial surface of incisors often has two shallow, vertical developmental depressions separating the crown into three portions that formed from three facial lobes (*Fig. 2-4A*). The three lobes also contribute to three rounded elevations on the incisal edge called **mamelons**, located on the incisal edges of newly erupted incisor teeth (*Fig. 2-4B*). Finally, remember that a fourth (lingual) lobe forms the lingual bulge called a cingulum. See *Table 2-1* for a summary of the number of lobes forming each type of incisor.

A. CLASS TRAITS OF MOST INCISORS FROM THE FACIAL VIEW

Refer to page 1 of the Appendix while studying the class traits (similarities) of most incisors. Note that there may be exceptions to the common incisor traits presented here, and these are emphasized with capital letters ("EXCEPT").

All **incisor crowns**, when viewed from the facial, have a relatively straight or slightly curved incisal edge (vs. all other types of teeth that have one or more pointed cusp tips). Their crowns are relatively *rectangular* and longer incisogingivally than wide mesiodistally (Appendix 1a). They taper from the widest mesiodistal areas at the proximal contacts, becoming narrower toward the cervical line (Appendix 1b).

Incisor crown outlines are more convex on the distal than on the mesial surfaces EXCEPT on mandibular central incisors, which are symmetrical (Appendix 1c). Incisor mesioincisal angles are more acute (sharper) than distoincisal angles EXCEPT on the symmetrical mandibular central incisors, where the angles are not noticeably different (Appendix 1d). Incisor crown contact areas at the greatest proximal heights of contour on mesial surfaces are located in the incisal third. On the distal surfaces, the contact areas are more cervical than the mesial EXCEPT on the distal of the mandibular central, which is at the same level as the mesial due to its symmetry (Appendix 1e). Before wear, the incisal edges of incisors slope cervically toward the distal EXCEPT on the symmetrical mandibular central (Appendix 1s). Finally, the cervical line curves toward the apex in the middle of the facial (and lingual) surfaces (Appendix 1l).

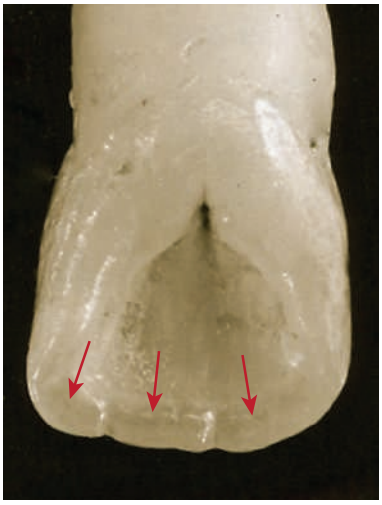
Incisor roots, when viewed from the facial, taper (become more narrow) from the cervical line to the apex (Appendix 1f). They are wider faciolingually than mesiodistally EXCEPT on maxillary central incisors, where the mesiodistal width is approximately the same as the faciolingual thickness (observe this difference in root widths by comparing the facial and mesial root views in Appendix 1g). Incisor roots may bend in the apical one third EXCEPT on maxillary central incisor roots, which are not as likely to bend. This root bend varies, but is more often toward the distal (Appendix 1h). All incisor roots are longer than the crowns (Appendix 1i).

B. CLASS TRAITS OF MOST INCISORS FROM THE LINGUAL VIEW

Incisor crowns, when viewed from the lingual, have less bulk in the lingual half because the mesial and distal surfaces converge lingually (best appreciated from the incisal view, Appendix 1j). The mesial and distal marginal ridges converge



A



B

FIGURE 2-4. **A.** A maxillary central incisor crown shows two facial depressions separating three facial portions formed by three lobes. **B.** This crown of a left maxillary central incisor, lingual view, shows three rounded protuberances on its incisal edge called **mamelons** (*arrows*). Also, notice the very deep **lingual pit** next to the cingulum.

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TABLE 2-1 Guideline for Determining the Number of Lobes for Incisors

TOOTH NAME	FACIAL LOBES	CINGULUM FROM ONE LINGUAL LOBE?	TOTAL NO. OF LOBES
Maxillary central incisor	3	Yes	3 + 1 = 4
Maxillary lateral incisor	3	Yes	3 + 1 = 4
Mandibular central incisor	3	Yes	3 + 1 = 4
Mandibular lateral incisor	3	Yes	3 + 1 = 4

General rule for incisors: Number of lobes = 3 facial lobes + 1 lobe for the cingulum.

toward the lingual cingulum (Appendix 1k). A lingual fossa is located between the marginal ridges and just incisal to the cingulum and is more prominent on maxillary incisors.

C. CLASS TRAITS OF MOST INCISORS FROM THE PROXIMAL VIEWS

Incisor crowns, when viewed from the proximal (mesial or distal), are wedge shaped or *triangular* (Appendix 1m). They have a *facial* outline that is more convex cervically than incisally, and the *facial* crest of curvature is in the cervical third, just incisal to the cervical line (Appendix 1n). The lingual crest of curvature is also convex and located in the cervical third on the cingulum, but the contours of the incisal two thirds of the lingual surface and the marginal ridges are concave from the cingulum area to the incisal edge. Therefore, the lingual outline is S shaped, being convex over the cingulum and concave or nearly flat from the cingulum to the incisal edge (Appendix 1p). The concave portion of the lingual surface on a maxillary anterior tooth is an important guiding factor in the closing movements of the lower jaw because the mandibular incisors glide along this concavity as the mandibular teeth move into maximum closure. Therefore, when restoring lingual contours of maxillary incisors, it is important to develop proper lingual contours that are in harmony with the occlusion.

The cervical line on the proximal surfaces curves toward the incisal edge. The resultant curve is greater on the mesial surface than on the distal (compare the mesial and distal views in Appendix 1o).

The **incisor roots**, when viewed from the proximal, are widest in the cervical third and gradually taper to a rounded apex (Appendix 1f).

D. CLASS TRAITS OF MOST INCISORS FROM THE INCISAL VIEW

Incisor crowns, when viewed from the incisal, have a lingual fossa that is concave just incisal to the cingulum and between the mesial and distal marginal ridges (Appendix 1t). They have an incisal ridge that terminates mesiodistally at the widest portion of the crown (Appendix 1q). The labial outline is convex but less curved than the more convex lingual outline (Appendix 1r). Marginal ridges converge from the mesial and distal incisal angles toward the cingulum (Appendix 1k), and the crown outline tapers from proximal contact area toward the cingulum (Appendix 1j) resulting in a narrower lingual than labial surface.

SECTION III ARCH TRAITS THAT DIFFERENTIATE *MANDIBULAR* FROM *MAXILLARY* INCISORS

Refer to page 2 of the Appendix while reading about these **arch traits** that can be used to differentiate *mandibular* from *maxillary* incisors.

A. MANDIBULAR INCISORS ARE SMALLER AND LOOK MORE ALIKE

Both types of mandibular incisors are generally smaller than either of the maxillary incisors (Appendix 2p). *Mandibular* central and lateral incisors look more alike and are more nearly the same size in the same mouth, compared to the larger sizes and greater differences between *maxillary* central and lateral incisors (best seen in the mouth in Fig. 2-2).

B. CONTACTS POSITIONED MORE INCISALLY ON MANDIBULAR INCISORS

From the facial view, the mesial and distal outlines are flatter on mandibular incisor crowns than on maxillary incisor crowns (compare maxillary to mandibular incisors in Appendix 2q) and have contact areas located closer to the incisal ridge than on maxillary incisors (Appendix 2i and 2r).

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C. MANDIBULAR INCISOR CROWNS ARE WIDER FACIOLINGUALLY

From the incisal view, mandibular incisor crowns are relatively wider faciolingually than mesiodistally compared to maxillary central incisors, which are wider mesiodistally[O] (compare incisal views in Appendix 2-h to 2-s).

D. MAXILLARY INCISORS HAVE PROMINENT LINGUAL ANATOMY

Mandibular incisor crowns have smoother lingual surfaces with less prominent anatomy than do maxillary crowns, which have deeper fossae and more pronounced marginal ridges (Appendix 2m and *Fig. 2-5A and B*).

E. MANDIBULAR INCISOR ROOTS ARE RELATIVELY LONGER

Mandibular incisor roots are longer in proportion to their crowns than are maxillary incisor roots, so mandibular incisors have larger root-to-crown ratios.

F. MANDIBULAR INCISAL RIDGES ARE MORE LINGUAL

From the proximal view, incisal ridges of mandibular incisors are usually positioned lingual to the midroot axis line, whereas the incisal ridges of maxillary incisors are more often on or labial to the root axis line (best seen from the proximal views on Appendix 2o).

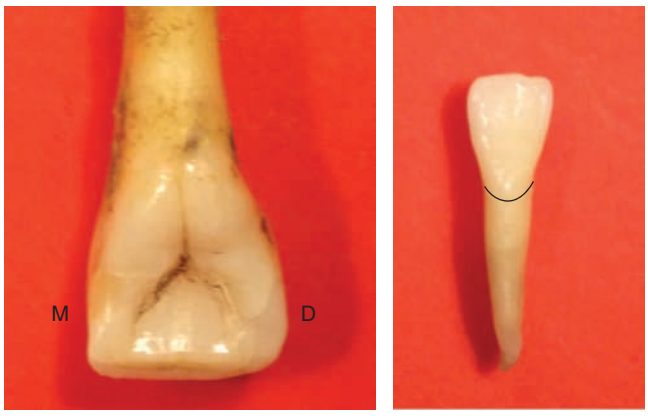


FIGURE 2-5. **A.** The lingual anatomy of a right maxillary central incisor is typical for **maxillary incisors**, with prominent marginal ridges and cingulum, and a deep fossa. **B.** The lingual anatomy of this mandibular central incisor is typical of **mandibular incisors** since it has very faint marginal ridges and cingulum and a shallow fossa.

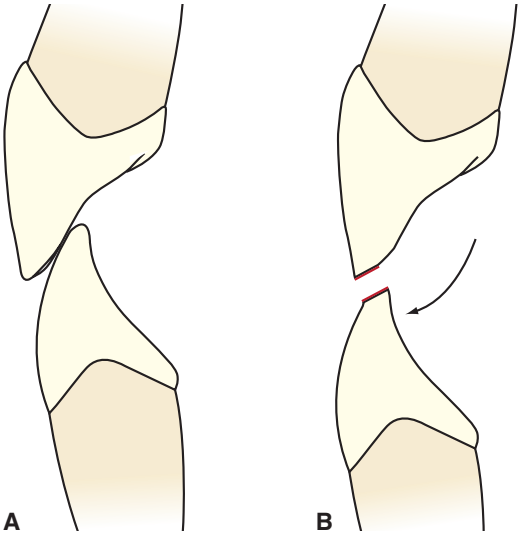


FIGURE 2-6. **A.** Proximal view of the ideal relationship between maxillary and mandibular incisors when *posterior* teeth are biting tightly together. **B.** The *arrow* indicates the direction of movement of mandibular incisors when the mandible moves forward (protrudes) with the incisors touching until they align edge to edge. The resultant *wear pattern* or **facets** on the incisal edges of *maxillary* incisors occur more on the lingual surface on the incisal edge, whereas wear occurs more on the facial surface of the incisal edge on *mandibular* incisors.

G. INCISAL EDGE WEARS LABIALLY ON MANDIBULAR INCISORS

Tooth wear (attrition) on the incisal ridges of incisors that occurs when shearing or incising food results in tooth wear that is in a different location on maxillary incisors compared to mandibular incisors (*Fig. 2-6*). This wear occurs when the labial part of the incisal edges of mandibular incisors slides forward and downward while contacting the lingual surface and part of the incisal edge of opposing maxillary incisors. The wear results in a shiny, flat, polished surface of enamel on the incisal edge called a **facet** [FAS it]. Assuming a normal tooth relationship, wear facets on *mandibular* incisors form on the *labial* surface next to the incisal edge. In contrast, wear facets on *maxillary* incisors form on the *lingual* surface next to the incisal edge, possibly extending to the lingual marginal ridges.

LEARNING EXERCISE

Refer to *Table 2-2* for a summary of the noticeable arch traits that distinguish maxillary from mandibular incisors, and see how many of them can be used to differentiate the rows of maxillary and mandibular incisors from various views in *Figures 2-7*, 2-9, 2-13, 2-17, 2-19, 2-22, 2-24, and 2-26.

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TABLE 2-2 Major Arch Traits That Distinguish Maxillary from Mandibular Incisors

	MAXILLARY INCISORS	MANDIBULAR INCISORS
LABIAL VIEW	Wider crowns mesiodistally Less symmetrical crown More rounded mesial and distal incisal angles Contact areas more cervical	Narrower crowns mesiodistally More symmetrical crowns More square mesial and distal incisal angles Contact areas very incisal
LINGUAL VIEW	Lingual anatomy more distinct: Pronounced marginal ridges Deeper lingual fossa Sometimes lingual pits Larger cingulum	Lingual surface smoother: Almost no marginal ridges Shallower lingual fossa No pits Smaller cingulum
PROXIMAL VIEWS	Incisal edge on or labial to midroot axis line Facets on lingual slope of incisal edge	Incisal edge on or lingual to midroot axis line Facets on labial slope of incisal edge
INCISAL VIEW	Crowns wider mesiodistally than faciolingually	Crowns wider faciolingually than mesiodistally
	Plus traits seen from lingual view can also be seen from the incisal view.	

SECTION IV TYPE TRAITS THAT DIFFERENTIATE **MAXILLARY** *CENTRAL* FROM *LATERAL* INCISORS (FROM ALL VIEWS)

OBJECTIVES FOR SECTION IV

This section is designed to prepare the learner to perform the following:

- Describe the type traits that can be used to distinguish the permanent maxillary *central* from *lateral* incisor.
- Describe and identify the labial, lingual, mesial, distal, and incisal surfaces for all maxillary incisors.
- Assign a Universal number to maxillary incisors present in a mouth (or on a model) with complete dentition. If possible, repeat this on a model with one or more maxillary incisors missing.
- Select and separate maxillary incisors from a selection of all teeth on a bench top.
- Holding a maxillary incisor, determine whether it is a central or a lateral and right or left. Then assign a Universal number to it.

Within this section, type traits are presented that distinguish *maxillary central* from *lateral* incisors. Other traits will be helpful when distinguishing right maxillary incisors from left maxillary incisors. These traits are presented for each view of the tooth: facial, lingual, proximal (includes mesial and distal traits), and incisal.

A. TYPE TRAITS OF MAXILLARY INCISORS FROM THE LABIAL VIEW

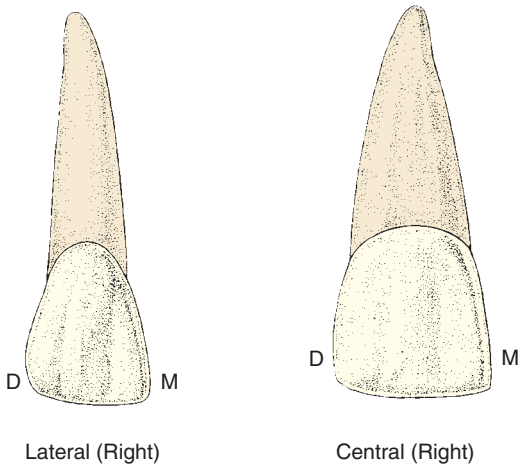
Ideally, examine several extracted maxillary central and lateral incisors or tooth models as you read the following. Hold these teeth root up and crown down, as they are positioned in the mouth. Also, refer to Appendix page 2 and refer to *Figure 2-7* as you study the labial traits of incisors.

1. Crown Shape of Maxillary Incisors (Labial View)

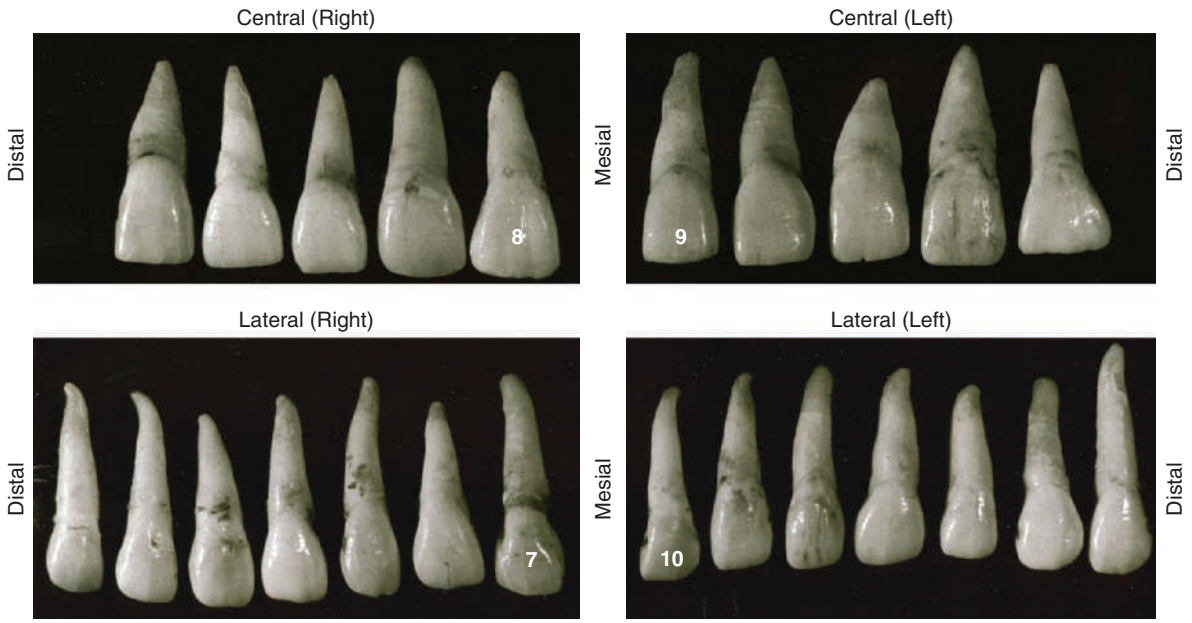
Based on Woelfel's studies, the crown of the **maxillary central incisor** is the longest of all human tooth crowns (although at least two other authors describe the **mandibular canine crown** as the longest crown overall[2,3]). The maxillary central also has the widest crown *of all incisors*. The crown is usually longer (incisogingivally) than wide (mesiodistally)[A] (Appendix 2a).

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FIGURE 2-7. Maxillary central and lateral incisors, **labial views**, with type traits that distinguish maxillary central from lateral incisors and traits that distinguish right and left sides.



MAXILLARY INCISORS: LABIAL VIEWS



TRAITS TO DISTINGUISH MAXILLARY CENTRAL FROM LATERAL INCISOR: LABIAL VIEW

CENTRAL INCISOR	LATERAL INCISOR
Larger crown, wider cervically	Smaller crown, narrower cervically
Mesial incisal angle is nearly a right angle	Mesial incisal angle is rounder
Distal contact at junction incisal/middle thirds	Distal contact is near middle third
Less likely root tip bend to distal	Root tip often bends to distal
Incisal edge closer to horizontal	Incisal edge slopes cervically toward distal

TRAITS TO DIFFERENT MAXILLARY RIGHT FROM LEFT INCISOR: LABIAL VIEW

CENTRAL INCISOR AND LATERAL INCISOR
Mesial crown outline flatter, distal more rounded
Distoincisal angle more rounded than mesioincisal angle
Distal contact more cervical than mesial contact
Incisal edge slopes shorter toward the distal

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The crown of the **maxillary lateral incisor** is also longer incisocervically, but it is considerably narrower mesiodistally than the crown of the maxillary central incisor. Since its root is longer, the entire lateral has a longer, more slender look[B] (Appendix 2a). The crown outline is less symmetrical than on the central incisor. Normally, the contour of the labial surface of the maxillary lateral incisor is more convex mesiodistally compared to the maxillary central. This may be best appreciated from the incisal view. Mamelons, and particularly labial depressions, are less prominent and less common on the maxillary lateral incisor than on the central incisor.

2. Proximoincisal Line Angles of the Maxillary Incisor (Labial View)

On the outline of **maxillary central incisors**, the angle formed by the mesial and incisal surfaces (called the mesioincisal angle) is close to a right angle. The distoincisal angle is more rounded, and the angle is slightly obtuse or greater than a right angle (Appendix 2b).

On **maxillary lateral incisors**, both the mesioincisal and distoincisal angles are more rounded than on the central incisor (Appendix 2b). The mesioincisal angle is more acute (sharper) than the distoincisal angle, accentuated by the incisal edge sloping cervically toward the distal, more so than on the maxillary central incisor (Appendix 2c).

3. Proximal Contact Most Cervical on Distal of Laterals (Labial View)

The *mesial* contacts of *both* the maxillary central and lateral incisors are in the incisal third, very near the incisal edge for the central and slightly more cervical on the lateral. The *distal* contacts of both incisors are more cervical than the mesial. For a maxillary central incisor, the distal contact is near the junction of the incisal and the middle thirds; for the maxillary lateral incisor, it is even more cervical, often in the middle third (making this distal contact the most cervical for any incisor, seen clearly on a lingual view in *Fig. 2-8*).

4. Maxillary Central Incisors Have Relatively Shorter Roots (Labial View)

On a **maxillary central incisor**, the root is only slightly longer than the crown resulting in a root-to-crown ratio that is the smallest of any permanent tooth (Appendix 2d). The **maxillary lateral incisor** root is longer than on the central.[C] This results in a root that appears longer in proportion to the crown than on the maxillary central incisor.

5. Root Thinner and Longer on Lateral Incisors (Labial View Compared with the Proximal View)

The root of the **maxillary central incisor** is thick in the cervical third and narrows through the middle to a blunt apex. Its outline and shape is similar to an ice cream cone. An apical bend is not common in the maxillary central incisor. The central incisor root is the only maxillary tooth that is as thick at the cervix mesiodistally as faciolingually. Compare the root width seen on the mesial view to the root width seen on the labial view in Appendix 2n. All other types of maxillary teeth have roots that are thicker faciolingually than mesiodistally.[D] Because of its shortness (a small root-to-crown ration) and conical shape, the maxillary central incisor root may be a poor choice to support a replacement tooth as part of a dental bridge, that is, a replacement tooth crown attached to, and supported by, two adjacent teeth.

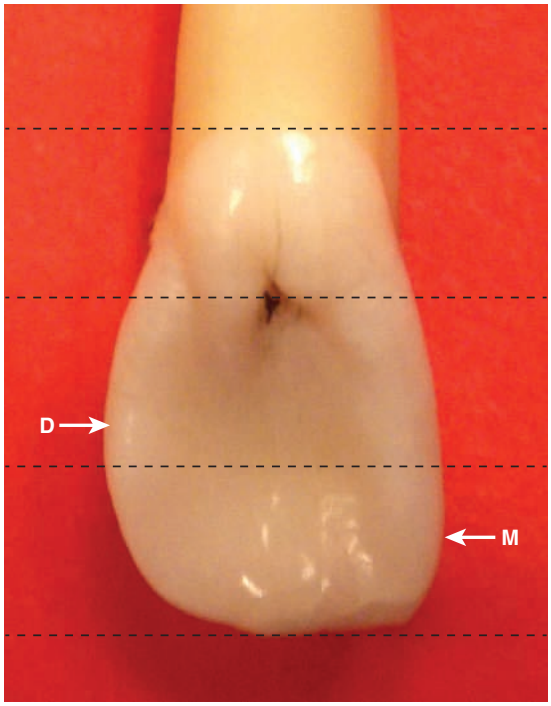


FIGURE 2-8. **Location of proximal contacts:** Typical of maxillary lateral incisors, the mesial proximal contact area is located in the incisal third while the distal contact is in the middle third. Also typical of maxillary lateral incisors is a deep lingual fossa with a caries-prone **pit** next to the cingulum.

The root of a **maxillary lateral incisor** is wider faciolingually than mesiodistally. It tapers evenly toward the rounded apex, and the apical end is commonly bent distally (seen in 12 of the 14 maxillary lateral incisors in Fig. 2-7, lower row). This potential for distal (or mesial) bend on most roots must be confirmed on radiographs and considered when extracting an incisor.

B. TYPE TRAITS OF MAXILLARY INCISORS FROM THE LINGUAL VIEW

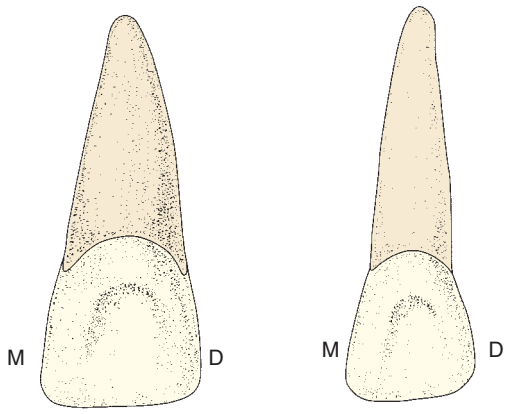
Refer to *Figure 2-9* while studying the lingual traits of maxillary incisors.

1. Lingual Fossae Deeper on Maxillary Lateral Incisors (Lingual View)

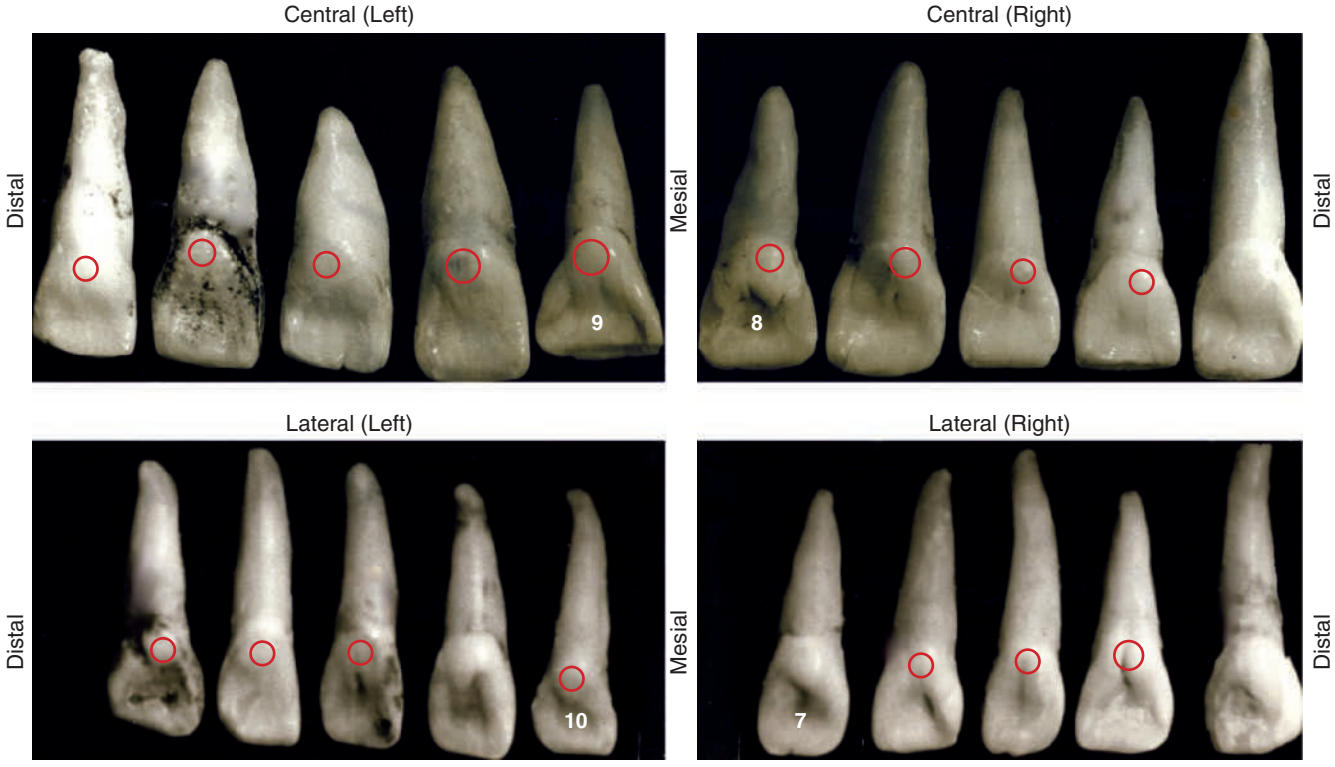
On maxillary incisors, large lingual fossae are located immediately incisal to the cingulum and bounded by two marginal

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FIGURE 2-9. Maxillary central and lateral incisors, **lingual views**, with type traits that distinguish maxillary central from lateral incisors and traits that distinguish right and left sides. Several circles highlight the more distally placed cingulum on many maxillary central incisors compared to maxillary lateral incisors.



MAXILLARY INCISORS: LINGUAL VIEWS



TRAITS TO DISTINGUISH MAXILLARY CENTRAL FROM LATERAL INCISOR: LINGUAL VIEW

CENTRAL INCISOR	LATERAL INCISOR
Larger shallow lingual fossa	Deep but small fossa
Cingulum distally positioned	Cingulum centered
Less frequent lingual pit	More common lingual pit

Plus outline characteristics seen from facial apply to lingual outline

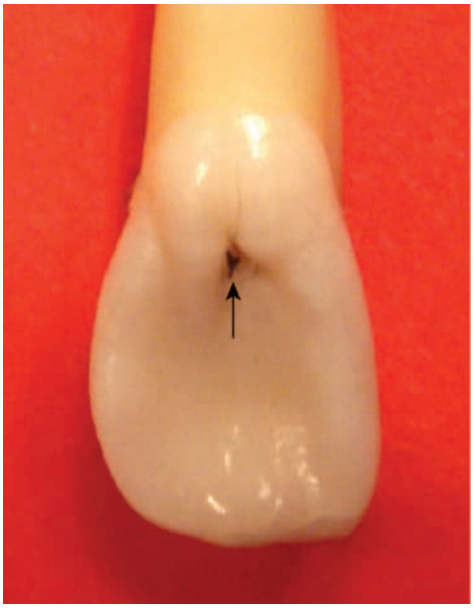
TRAITS TO DIFFERENTIATE MAXILLARY RIGHT FROM LEFT INCISOR: LINGUAL VIEW

CENTRAL INCISOR	LATERAL INCISOR
Cingulum toward distal	Longer and straighter mesial marginal ridge
Distal marginal ridge more curved than mesial	

Both have longer mesial marginal ridge

Plus outline characteristics from facial also apply for lingual outline

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A



B

FIGURE 2-10. **A.** A maxillary lateral incisor has a **lingual pit** with beginning decay (*arrow*). **B.** An unusual **lingual root groove** crosses the cingulum and extends on to the root and contributed to periodontal disease.

ridges. The lingual fossa of the **maxillary lateral incisor**, although smaller in area, is often even more pronounced than on the central incisor, and it is more likely to have a pit in the deep fossa that is prone to decay (*Fig. 2-10A*). Note the deeper lingual fossae on many maxillary lateral incisors compared to central incisors in Figure 2-9. Although not common, accessory grooves may extend from the lingual fossa around the cingulum and onto the root surface resulting in an increased risk of decay and gingival disease (*Fig. 2-10B*).

2. Cingulum of Maxillary Incisors (Lingual View)

The cingulum on the **maxillary central incisor** is usually well developed and is located off-center, *distal* to the root axis line that bisects the root longitudinally. (This can also be seen from the incisal view.) The cingulum on the **maxillary lateral incisor** is narrower than on the central, and it is almost centered on the root axis line. This difference in location of the cingula, more distal on the central and more centered over the root on the lateral, is best seen incisally in Appendix 2e and is highlighted on many teeth in Figure 2-9.

3. Marginal Ridges of Maxillary Incisors (Lingual View)

The mesial and distal marginal ridges vary in prominence on all maxillary incisors from one person to another. They may be prominent or inconspicuous, possibly worn smooth from attrition. One type of maxillary incisor with a deep lingual fossa and prominent mesial and distal marginal ridges is called "shovel-shaped incisors"[E] (*Fig. 2-11*).[4–8]

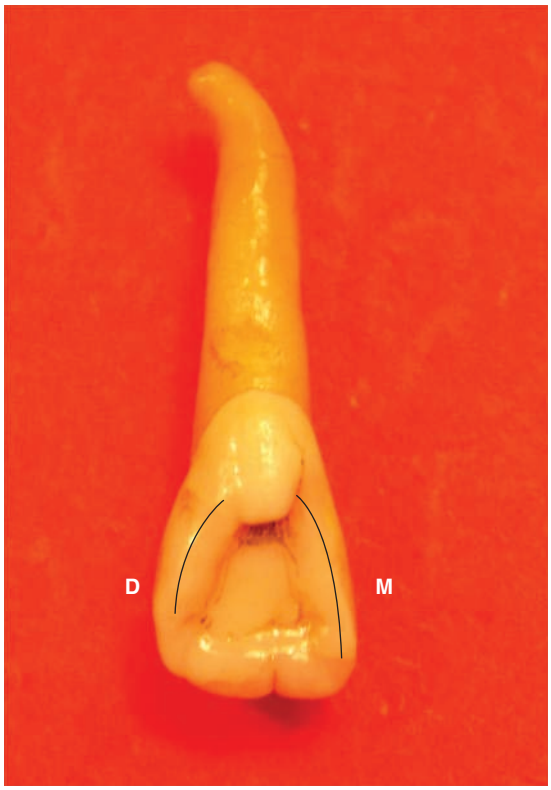


FIGURE 2-11. The crown of this left maxillary lateral incisor has such prominent marginal ridges that it may be called "**shovel shaped**." The straighter mesial marginal ridge is longer than the curved distal marginal ridge, which is typical of most incisors EXCEPT mandibular centrals. *Hint*: Think of the length of a marginal ridge on an anterior tooth as the distance from where the ridge meets the cingulum to where it disappears (between the proximal contact and the incisal edge).

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On the *both* types of maxillary incisors, *mesial* marginal ridges (from the incisal edge to the cingulum) are longer than the distal marginal ridges due in part to the taper of the incisal edge from mesial to distal (Appendix 2f and Fig. 2-11). This is also accentuated on the maxillary central incisor because its cingulum is off center toward the distal. Further, the shorter distal marginal ridges are more curved compared to the mesial marginal ridges that are straighter incisocervically (seen in Fig. 2-11 and on most incisors in Fig. 2-9).

4. Pits on Maxillary Incisors (Lingual View)

On *both* types of maxillary incisors, but more frequently in lateral incisors, a lingual pit may be detectable at the incisal border of the cingulum where the mesial and distal marginal ridges converge. This pit may need to be restored or sealed in order to prevent or arrest decay. (Notice the deep lingual pits in Fig. 2-10A and on several maxillary lateral incisors in Fig. 2-9.)

5. Accessory Ridges and Grooves on Maxillary Incisors (Lingual View)

Small, narrow accessory lingual ridges separated by subtle grooves may extend vertically from the cingulum toward the center of the lingual fossa in *both types* of maxillary incisors (fewer in maxillary laterals). There could be from one to four accessory ridges. Tooth 9 in *Figure 2-12* shows these accessory ridges most clearly. Tiny grooves separate these ridges.[F,G]

6. Root Contour of Maxillary Incisors (Lingual View)

The root contour of all maxillary incisors, like all anterior teeth, is convex and tapers, becoming narrower toward the lingual surface so that some of the proximal surfaces are visible from the lingual view (Fig. 2-9).

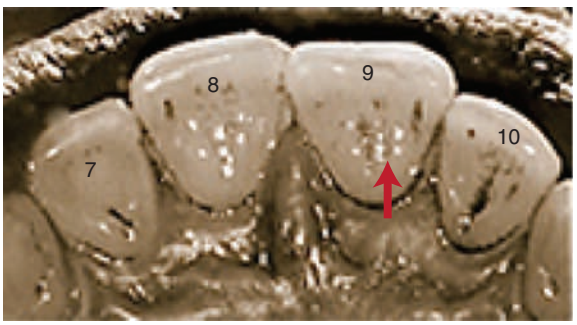


FIGURE 2-12. The light reflecting on the lingual surfaces of these maxillary incisors reveals **accessory ridges**, especially on tooth 9 (at the *arrow*).

C. TYPE TRAITS OF MAXILLARY INCISORS FROM THE PROXIMAL VIEWS

Refer to *Figure 2-13* while studying the proximal traits of maxillary incisors.

1. Incisal Edges Labial to Root Axis: Maxillary Central Has Slight Distolingual Twist (Proximal Views)

On both maxillary incisors, the incisal edge is commonly just labial to the root axis line or may be on the root axis line (Appendix 2o). From the mesial side, the slight **distolingual twist** of the incisal ridge of the maxillary central incisor places the distal portion at the ridge even somewhat more lingual than on the mesial (best appreciated from the incisal view in Appendix 2g and *Fig. 2-14*).

2. Cervical Line of Maxillary Incisors (Proximal Views)

As on all anterior teeth, the cervical line of both types of maxillary incisors curves incisally on the mesial and distal tooth surfaces, and this curvature is greater on the mesial surface than on the distal surface, as can be seen on the lingual surface of a central incisor in *Figure 2-15.* To confirm this difference in curvature, it is often necessary to turn the tooth slightly to view the amount of curvature on the mesial and then turn it the other way to confirm the amount of curvature on the distal. This difference is most pronounced on anterior teeth. The amount of curvature of the cervical line on the mesial of the maxillary central incisor is *larger* than for any other tooth, extending incisally one fourth or more of the crown length (*Fig. 2-16)*, whereas the distal cervical line curves less. The curvature of the mesial cervical line of the **maxillary lateral incisor** is also considerable but slightly less than on the central.[H]

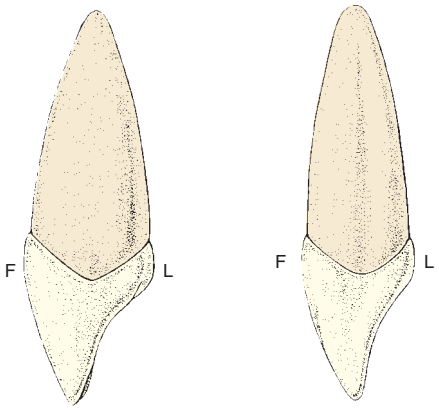
3. Root Shape and Root Depressions of Maxillary Incisors (Proximal Views)

The root of the **maxillary central incisor** is wide faciolingually at the cervix and tapers to a rounded apex. The *lingual* root outline is nearly straight in the cervical third and then curves labially toward the tip in the middle and apical thirds. The entire *labial* root outline is even straighter. From the proximal view, this flatter facial root outline and more convex lingual root outline are evident in many central incisors in Figure 2-13. In contrast, the root of the **maxillary lateral incisor** tapers more evenly throughout the root toward the blunt apex.

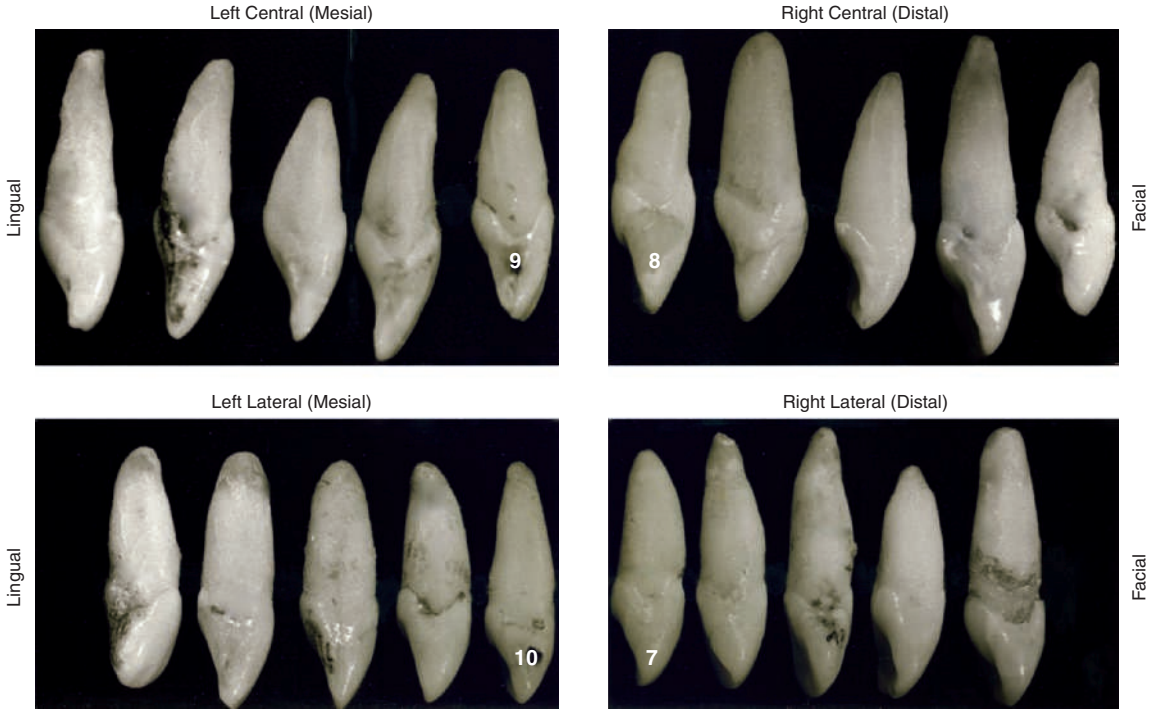
The *mesial* root surfaces of both types of maxillary incisors could have a slight depression in the middle third cervicoapically, slightly lingual to the center faciolingually, but the *distal*

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FIGURE 2-13. Maxillary central and lateral incisors, **proximal views**, with type traits that distinguish maxillary central from lateral incisors and traits that distinguish right and left sides.



MAXILLARY INCISORS: PROXIMAL VIEWS



TRAITS TO DISTINGUISH MAXILLARY CENTRAL FROM LATERAL INCISOR: PROXIMAL VIEWS	
CENTRAL INCISOR	**LATERAL INCISOR**
More concave lingual crown outline Root outline more convex on lingual than facial	Less concave lingual crown outline More even root taper facially and lingually

TRAITS TO DIFFERENTIATE MAXILLARY RIGHT FROM LEFT INCISOR: COMPARING PROXIMAL VIEWS
CENTRAL INCISOR AND LATERAL INCISOR
Cervical line curvature more pronounced on mesial than distal Flatter mesial root surface contour than distal contour

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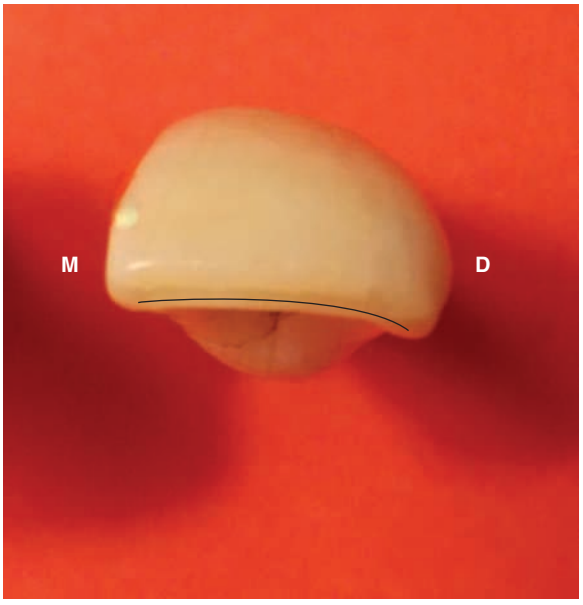


FIGURE 2-14. This left *maxillary central incisor* shows a subtle **distolingual twist** of the incisal edge, which is more lingual on the distal half than on the mesial half.

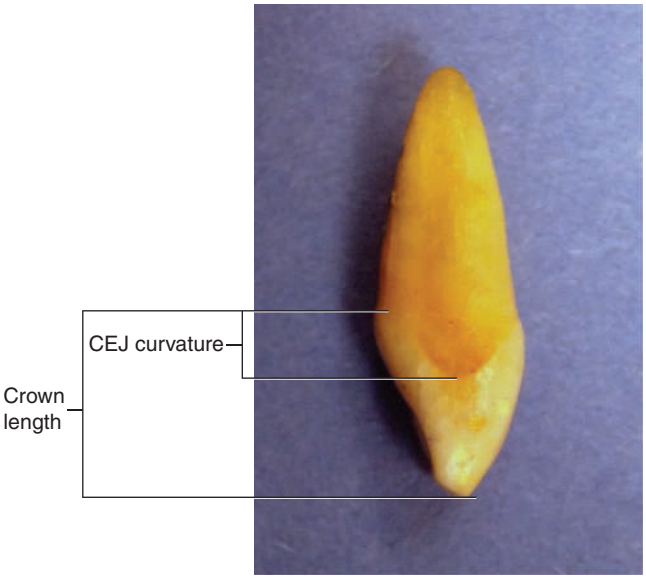


FIGURE 2-16. Mesial view of this maxillary central incisor shows the greatest amount of curvature of the **cementoenamel junction** (CEJ) on any tooth: the amount of curvature is one fourth or more of the crown length.

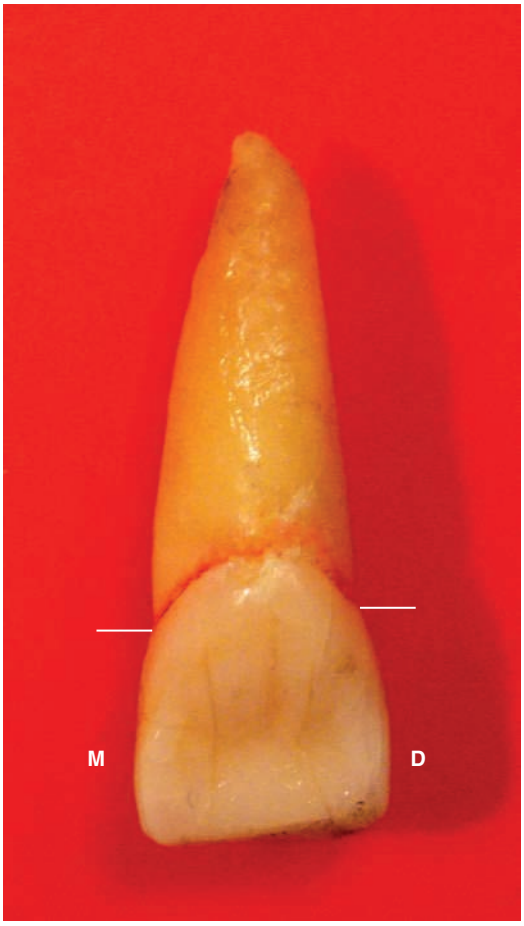


FIGURE 2-15. On the lingual of this right maxillary central incisor, you can just see that the **curve of the cementoenamel junction** or cervical line (marked with *red* pencil) is greater (extends more incisally) on the mesial than on the distal, a trait for most teeth in the mouth.

root surfaces are likely to be convex. A slight *mesial* root depression is discernible in the shaded line drawings in Figure 2-13.

D. TYPE TRAITS OF MAXILLARY INCISORS FROM THE INCISAL VIEW

Refer to *Figure 2-17* when studying the incisal view. To follow this description, a maxillary incisor should be held in such a position that the incisal edge is toward you, the labial surface is at the top, and you are looking exactly along the root axis line. You should see slightly more lingual surface than labial surface if the incisal ridge is located somewhat labial to the root axis line (as in many teeth, especially the lateral incisors, in Fig. 2-17).

1. Crown Proportion Faciolingually versus Mesiodistally for Maxillary Incisors (Incisal View)

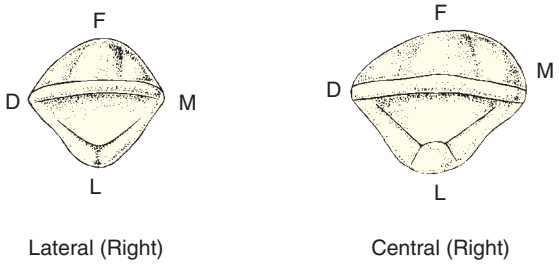
The incisal outline of the **maxillary central incisor** is noticeably wider mesiodistally than faciolingually (Appendix 2h). The mesiodistal measurement of the **lateral incisor** crown is also most often greater than the labiolingual measurement but less so than on the central incisor.[1] On some lateral incisors, the two dimensions of the crown are almost the same size faciolingually as mesiodistally. Notice this difference in the proportion of maxillary central incisors (relatively wider mesiodistally) compared to lateral incisors in Figure 2-17.

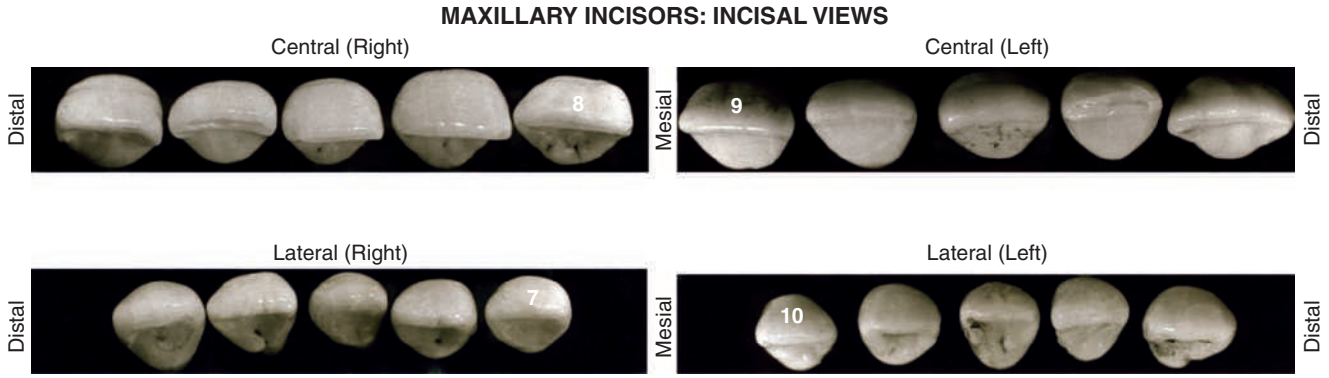
2. Crown Outline Shape and Cingulum Location of Maxillary Incisors (Incisal View)

The incisal outline of the **maxillary central incisor** is somewhat *triangular*. The labial outline is broadly curved (on some

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FIGURE 2-17. Maxillary central and lateral incisors, **incisal views**, with type traits that distinguish maxillary central from lateral incisors and traits that distinguish right and left sides.





TRAITS TO DISTINGUISH MAXILLARY CENTRAL FROM LATERAL INCISOR: INCISAL VIEW	
CENTRAL INCISOR	**LATERAL INCISOR**
Crown noticeably wider mesiodistally than faciolingually	Crown minimally wider mesiodistally than faciolingually
Crown outline roughly triangular	Crown outline more round or oval
Cingulum off center to distal	Cingulum centered
Incisal edge curves mesiodistally	Incisal edge straighter mesiodistally

TRAITS TO DIFFERENTIATE MAXILLARY RIGHT FROM LEFT INCISOR: INCISAL VIEW	
CENTRAL INCISOR	**LATERAL INCISOR**
Cingulum more distal	Best to use other views

teeth, the middle third may be nearly flat) forming the base of the triangle, and the other two sides of the triangle converge toward the cingulum (*Fig. 2-18*). As was seen from the lingual view, the cingulum of the maxillary central incisor is slightly off-center to the distal, resulting in the mesial marginal ridge measuring longer than the distal marginal ridge (seen best from the lingual view in Appendix 2f).

The crown of the **lateral incisor** resembles the central incisor from this aspect, but its outline is more *round or oval* than triangular since the labial outline is noticeably more convex than on the central incisor. The cingulum of the lateral incisor is nearly centered mesiodistally. Compare the triangular shape of the maxillary central incisor to the more round or slightly oval shape of the maxillary lateral incisor in Figure 2-18. These differences in outline shapes are also evident in all teeth in Figure 2-17.

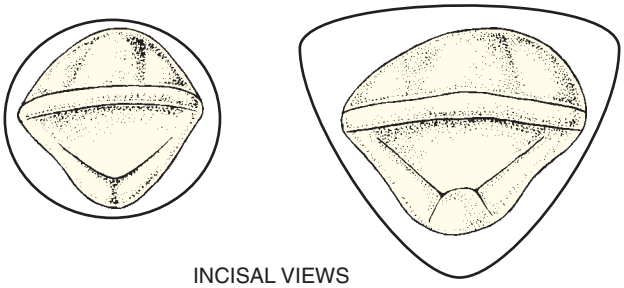


FIGURE 2-18. The **outline** of the maxillary lateral incisor (on the left) is almost *round* or slightly *oval*, whereas the outline of the maxillary central incisor is somewhat *triangular* in shape due to its flatter labial surface.

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3. Maxillary Central Incisor May Have a Very Slight Distolingual Twist (Incisal View)

The incisal ridge or edge of the **maxillary central incisor** is thick faciolingually (1.5 to 2 mm) and is slightly curved from mesial to distal, the convexity being on the labial side. It terminates mesially and distally at the widest portion of the crown (Appendix 1q). The position of the distoincisal angle may be slightly more lingual than the position of the mesioincisal angle, which then gives the incisal edge its slight **distolingual twist** as though someone took the distal half of the incisal edge and twisted it to the lingual (Appendix 2g and Fig. 2-14). Be aware that for **maxillary central incisors**, the two traits just discussed (the cingulum displaced to the distal and the distolingual twist of the incisal edge) are dependent on how the tooth is held. When viewed from the incisal, the distolingual twist of the incisal edge is more obvious when the cingulum is aligned vertically (Appendix 2g), whereas the displacement of the cingulum to the distal is more obvious when the incisal edge is aligned horizontally (Appendix 2e). This is why these two traits are shown on page 2 of the Appendix, showing two views of the same tooth, each having a slightly different alignment to accentuate the trait being discussed.

The incisal ridges on **lateral incisors** are straighter mesiodistally than on the central incisors.

LEARNING EXERCISE

In determining a right from a left maxillary central incisor when it is not in the mouth (such as on the operatory table with other incisors after multiple extractions), you need to distinguish the mesial from the distal surface. If you look at the facial surface of a tooth with its root aligned correctly for the correct arch and are able to identify the mesial or distal surface, you can place the tooth in its correct quadrant (right or left) and assign its Universal number. Evaluate the rows of maxillary incisors in the figures in this chapter, and, using the chart in each figure, see how many "right from left" traits can be used to differentiate the mesial from the distal surfaces and therefore right from left incisors. For example, in Figure 2-7, look at the **labial** surfaces for the shape of the incisal angles (more rounded on distal) and the position of the contact areas (more cervical on distal), or look at the **proximal** surfaces in Figure 2-13 for the amount of cervical line curvature on the mesial and distal sides (more curved on mesial). From the **lingual** view, look at Figure 2-9 for the length of the marginal ridges (mesial is longer), and from the **incisal** view on the maxillary central (Fig. 2-17), look for the distal location of the cingulum on many maxillary central incisors.

SECTION V TYPE TRAITS THAT DISTINGUISH **MANDIBULAR** *CENTRAL* FROM *LATERAL* INCISORS (FROM ALL VIEWS)

OBJECTIVES

This section is designed to prepare the learner to perform the following:

- Describe the type traits that can be used to differentiate the permanent mandibular central from the lateral incisor.
- Describe and identify the labial, lingual, mesial, distal, and incisal surfaces for mandibular *lateral* incisors and the labial, lingual, and incisal surfaces for the symmetrical mandibular *central* incisor (where the mesial may be difficult to distinguish from the distal).
- Assign a Universal number to mandibular incisors present in a mouth (or on a model) with complete dentition. If possible, repeat this on a model with one or more mandibular incisors missing.
- Select and separate mandibular incisors from a selection of all teeth on a bench top.
- Holding a mandibular incisor, determine whether it is a central or a lateral and right or left. Then, assign a Universal number to it (which may not be possible for the symmetrical mandibular central incisor, which you could identify as tooth 24 *or* 25).

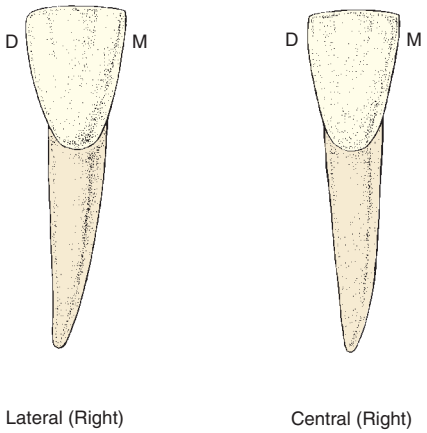
Within this section, type traits are presented that distinguish mandibular central incisors from lateral incisors. Other traits will be helpful when distinguishing right from left mandibular incisors. These traits are presented for each view of the tooth: facial, lingual, proximal (including mesial and distal), and incisal.

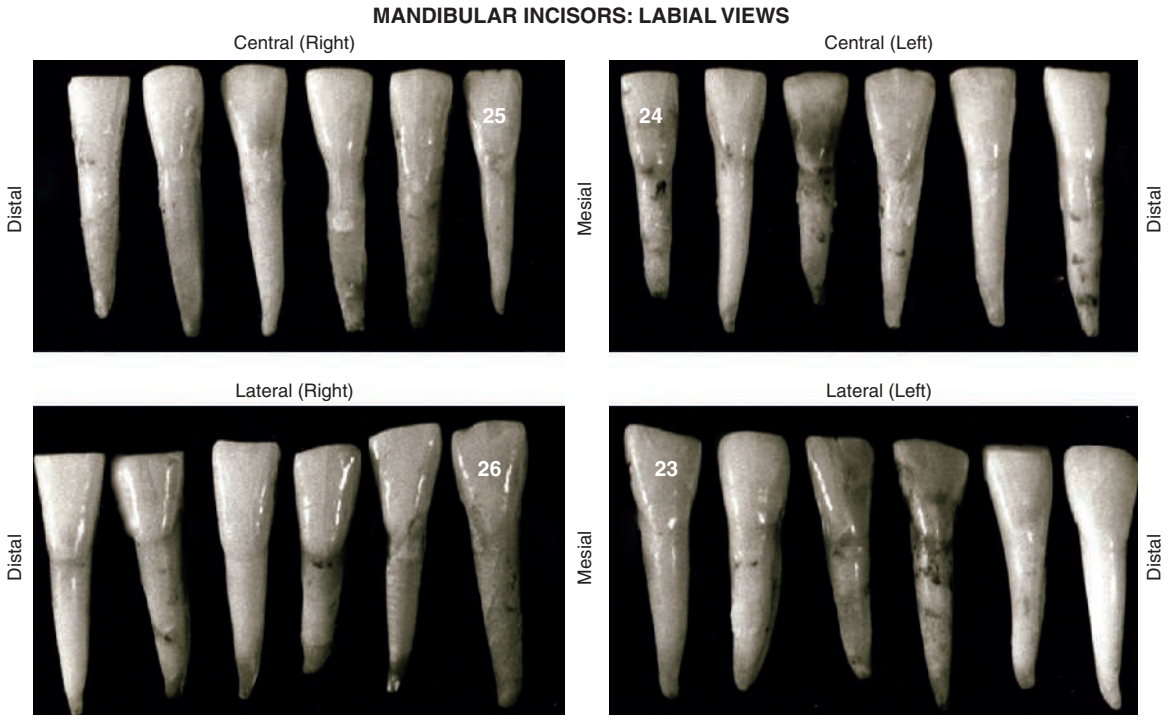
A. TYPE TRAITS OF MANDIBULAR INCISORS FROM THE LABIAL VIEW

Examine several extracted teeth and/or models as you read. Also, refer to page 2 of the Appendix and *Figure 2-19* while you study the labial surface of mandibular incisors. Hold

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FIGURE 2-19. Mandibular central and lateral incisors, **labial views**, with type traits that distinguish mandibular central from lateral incisors and traits that distinguish right and left sides.





TRAITS TO DISTINGUISH MANDIBULAR CENTRAL FROM LATERAL INCISOR: LABIAL VIEW

CENTRAL INCISOR	LATERAL INCISOR
More symmetrical crown	Less symmetrical crown
Minimal distal and mesial bulge of crown	Obvious distal bulge on crown, crown appears to tilt distally
Proximal contacts on same level mesial and distal	Mesial proximal contact more incisal
Smaller than lateral in the same mouth	Larger than central in the same mouth

TRAITS TO DIFFERENTIATE MANDIBULAR RIGHT FROM LEFT INCISOR: LABIAL VIEW

CENTRAL INCISOR	LATERAL INCISOR
Very symmetrical: cannot easily tell right from left	Distal crown outline bulges more than mesial
	Distal proximal contact more cervical
	Distal incisal line angle more rounded

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mandibular teeth with the root down and crown up, the position of the teeth in the mouth.

1. Crown Shape of Mandibular Incisors (Labial View)

Three mamelons are often present on newly emerged mandibular incisors and reflect the formation of the facial surface from three labial lobes (*Fig. 2-20*). In most persons, they are soon worn off by functional contacts against the maxillary incisors (a process called **attrition**).

All mandibular incisor crowns are quite narrow relative to their crown length, but the mandibular central incisor crown is the narrowest crown in the mouth and is considerably narrower than the *maxillary central incisor*.[J] Unlike maxillary incisor crowns in the same mouth where the central is larger than the lateral, the mandibular lateral incisor crown is a little larger in all dimensions than the mandibular central incisor in the same mouth, as seen in *Figure 2-21*. Further, the **mandibular central incisor** is so *symmetrical* that it is difficult to tell lefts from rights unless in place in the mouth or on full arch models. About the only notable difference to be found is the greater mesial than distal curvature of the cervical line, but this is not a trait that can be seen in the mouth.

The crown of the **mandibular lateral incisor** resembles that of the mandibular central incisor, but it is slightly wider and is not as bilaterally symmetrical. Its crown appears to tilt slightly distally on its root, giving the impression that the tooth has been bent at the cervix (Appendix 2l). This tilt, plus the sloping of the incisal edge shorter on the distal (Appendix 1s), makes the curved *distal outline* of the crown from proximal contact area to cervical line shorter than the straighter mesial crown outline. Look at the incisors in Figure 2-19, and notice the lack of symmetry of the outline of most mandibular lateral incisors compared to the symmetry of the central incisors. When comparing these teeth, be aware that the incisal edges may have worn unevenly.



FIGURE 2-20. These mandibular incisors have remnants of three **mamelons** that reflect the formation of the labial surface of incisors from three labial lobes (plus one lingual lobe forms the cingulum). These mamelons are partially worn away due to these teeth biting against maxillary incisors.



FIGURE 2-21. When considering the **relative size of each type of incisor**, it becomes obvious on this model that the maxillary central incisors are widest and largest, followed by the maxillary laterals, then the mandibular laterals, and finally the smallest and narrowest mandibular central incisors.

The labial surfaces of *both* types of mandibular incisors are most often smooth, but could have two shallow developmental depressions in the incisal third if you examine the surface closely.[K]

2. Incisal Proximal Angles of Mandibular Incisors (Labial View)

The crown of the **mandibular central incisor** is nearly bilaterally symmetrical, so the mesioincisal and distoincisal angles are very similar, forming nearly right angles (Appendix 2j). The distoincisal angle may barely be more rounded than the mesioincisal angle. The distoincisal angle of the **mandibular lateral incisor**, however, is noticeably more rounded than the mesioincisal angle (Appendix 2j). This helps to distinguish right mandibular lateral incisors from lefts prior to incisal tooth wear.

3. Proximal Contact Areas of Mandibular Incisors (Labial View)

The mesial and distal contact areas of the **mandibular central incisor** are at the same level: in the incisal third (Appendix 2i) almost level with the incisal edge. The mesial and distal contact areas of the **lateral incisor** are not at the same level (Appendix 2i). Although both the mesial and distal contacts are in the incisal third fairly close to

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TABLE 2-3 Location of Proximal Contacts (Proximal Height of Contour) on Incisors (Best Seen from Facial View)

		MESIAL SURFACE (WHICH THIRD OR JUNCTION?)	DISTAL SURFACE (WHICH THIRD OR JUNCTION?)
MAXILLARY CROWNS	Central incisor	Incisal third (near incisal edge)	Incisal/middle junction
	Lateral incisor	Incisal third	Middle third (*most cervical of incisor contacts*)
MANDIBULAR CROWNS	Central incisor	Incisal third (near incisal edge)	Incisal third (near incisal edge; same as mesial)
	Lateral incisor	Incisal third (near incisal edge)	Incisal third (but more cervical)

General learning guidelines for incisors:
1. On the same incisor, the distal proximal contact is more cervical than the mesial contact EXCEPT on mandibular central incisors, where the mesial and distal contacts are at the same height.
2. All contacts for both types of *mandibular* incisors are in the incisal third, as are the *mesial* contacts on *maxillary* incisors. Distal contacts of maxillary central incisors are near the incisal/middle junction, and the distal contacts on maxillary lateral incisors are most cervical: in the middle third.

the incisal edge, the distal contact is noticeably more cervical than the mesial contact on lateral incisors. Refer to *Table 2-3* for a summary of the location of proximal contacts for all incisors.

4. Root-To-Crown Proportions of Mandibular Incisors (Labial View)

Mandibular incisor roots are long incisocervically and appear proportionally longer compared to their crown length than on the maxillary incisors. Therefore, the root-to-crown ratio is larger for both mandibular incisors compared to maxillary central and lateral incisors.[L]

5. Root Shape of Mandibular Incisors (Labial View)

The roots of *both* types of mandibular incisors appear very narrow mesiodistally but wide faciolingually (ribbon-like) (compare proximal to labial surfaces in Appendix 2n) and taper uniformly on both sides from the cervical line to the apex. The apical end may curve slightly to the distal (seen in some incisors in Fig. 2-19).

B. TYPE TRAITS OF MANDIBULAR INCISORS FROM THE LINGUAL VIEW

Refer to *Figure 2-22* while studying the lingual surface of mandibular incisors.

1. Cingulum of Mandibular Incisors (Lingual View)

As seen from the lingual view (or from the incisal view in Appendix 2k), the cingulum of the **mandibular central incisor** is convex, small, and *centered* on the axis line of the root. The cingulum of the **lateral incisor** lies slightly *distal* to the axis line of the root (similar to the maxillary central incisor). This distal location of the cingula on mandibular lateral incisors is highlighted in Figure 2-22.

2. Lingual Anatomy (Marginal Ridges and Fossae) of Mandibular Incisors (Lingual View)

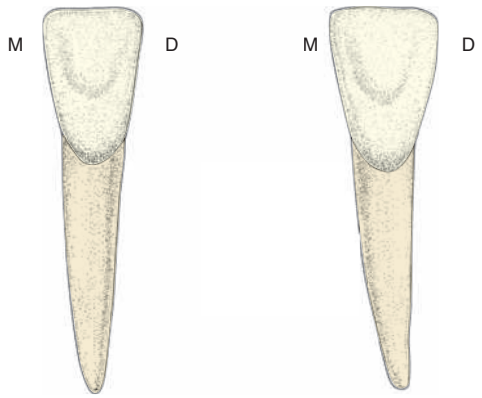
The lingual fossae of *both* types of mandibular incisors are barely visible, smooth (without grooves, accessory ridges, or pits), and shallow, just slightly concave in the middle and incisal thirds (Appendix 2m). The marginal ridges of mandibular incisors are often scarcely discernible, unlike on *maxillary* incisors, where they are more likely to be quite prominent (*Fig. 2-23*). Since the length of the incisal edge slopes cervically toward the distal on mandibular *lateral* incisors, and the cingulum is located toward the distal, the mesial marginal ridge on these teeth appears longer than the distal marginal ridge (Appendix 2k).

3. Root Contours of Mandibular Incisors (Lingual View)

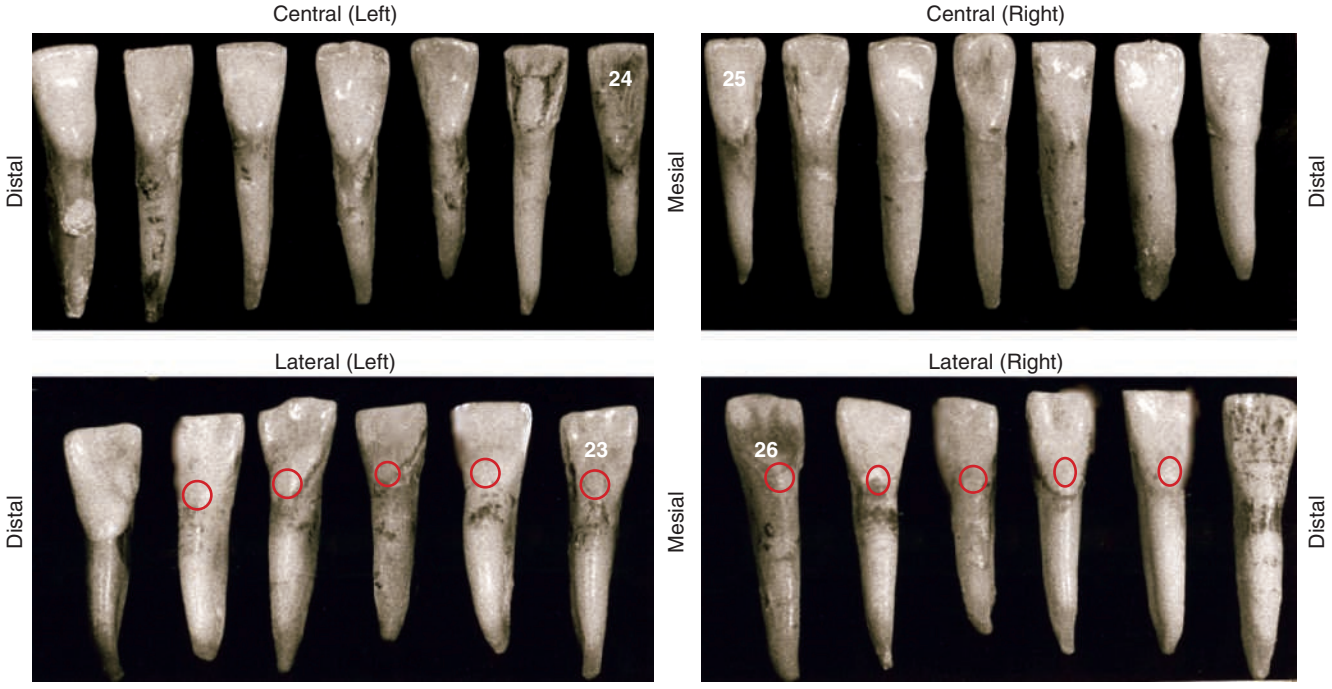
As with other incisor roots, the *lingual* root surfaces of *both* types of mandibular incisors are mostly convex, and slightly

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FIGURE 2-22. Mandibular central and lateral incisors, **lingual views**, with type traits that distinguish mandibular central from lateral incisors and traits that distinguish right and left sides. *Circles* highlight the distal placement of most cingula on these mandibular lateral incisors.



MANDIBULAR INCISORS: LINGUAL VIEWS



TRAITS TO DISTINGUISH MANDIBULAR CENTRAL FROM LATERAL INCISOR: LINGUAL VIEW

CENTRAL INCISOR	LATERAL INCISOR
Cingulum centered Same length mesial and distal marginal ridges	Cingulum distal to center Longer mesial marginal ridge

TRAITS TO DIFFERENTIATE MANDIBULAR RIGHT FROM LEFT INCISOR: LINGUAL VIEW

CENTRAL INCISOR	LATERAL INCISOR
Very symmetrical: cannot tell right from left	Cingulum distal to center Shorter distal marginal ridge

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FIGURE 2-23. You can see the mesial root depression of this mandibular central incisor even from the lingual view. Notice that the lingual surface of the crown is smooth with little evidence of marginal ridges or lingual fossa: typical of most mandibular incisors.

narrower on the lingual side than on the labial side. You may see evidence of mesial and distal longitudinal root depressions from this view (Fig. 2-23).

C. TYPE TRAITS OF MANDIBULAR INCISORS FROM THE PROXIMAL VIEWS

Refer to *Figure 2-24* while studying the proximal surfaces of mandibular incisors.

1. Incisal Edge on Mandibular Incisors (Proximal Views)

The incisal edges of *both* types of mandibular incisors are normally located on or lingual to the midroot axis (Appendix 2o). From the mesial side, the *distolingual twist* of the incisal ridge of the **mandibular lateral incisor** places the distal portion at the ridge even somewhat more lingual than on the mesial (seen clearly in *Fig. 2-25*), unlike the mandibular central that has no twist. Recall that the *maxillary* central incisor might also exhibit a slight distolingual twist of the incisal edge, but it is much less obvious than on most mandibular laterals.

2. Cervical Line on Mandibular Incisors (Proximal Views)

The cervical line on the mesial of *both* types of mandibular incisors normally has a relatively pronounced curvature that extends incisally almost one fourth of the crown length. As on all other anterior teeth, the curvature on the distal is less.[M]

3. Crest of Curvature of Mandibular Incisors (Proximal Views)

As on the *labial* outline of maxillary incisors, the labial crests of curvature (heights of contour) on *both* types of mandibular incisors are in the cervical third, just incisal to the cervical line. The labial outline becomes nearly flat in the incisal third. The *lingual* outlines are "S" shaped, and the heights of contour are also in the cervical third, on the cingulum.

4. Root Shape and Depressions of Mandibular Incisors (Proximal Views)

The relatively wide faciolingual dimension of the roots at the cervix on *both* types of mandibular incisors is very apparent from the proximal view. The facial and lingual outlines of the roots of all mandibular incisors are nearly straight from the cervical line to the middle third; then, the root tapers with its apex on the midroot axis line (seen in most roots in Fig. 2-24). Recall that the cervical portion of the roots of mandibular incisors is considerably wider faciolingually than mesiodistally (ribbon-like).[N]

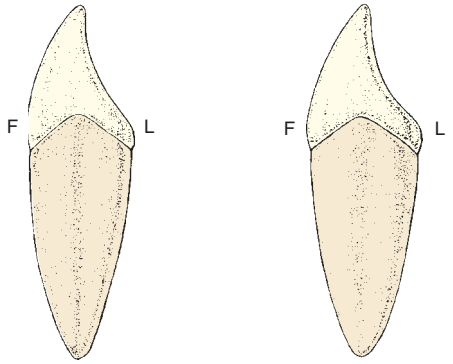
There is usually a slight longitudinal depression on the middle third of the mesial and distal root surfaces of *both* types of mandibular incisors. The distal depressions are somewhat more distinct. See *Table 2-4* for a summary of incisor root depressions. See Figure 2-25 for a slight mesial surface depression on the root of a mandibular lateral incisor.

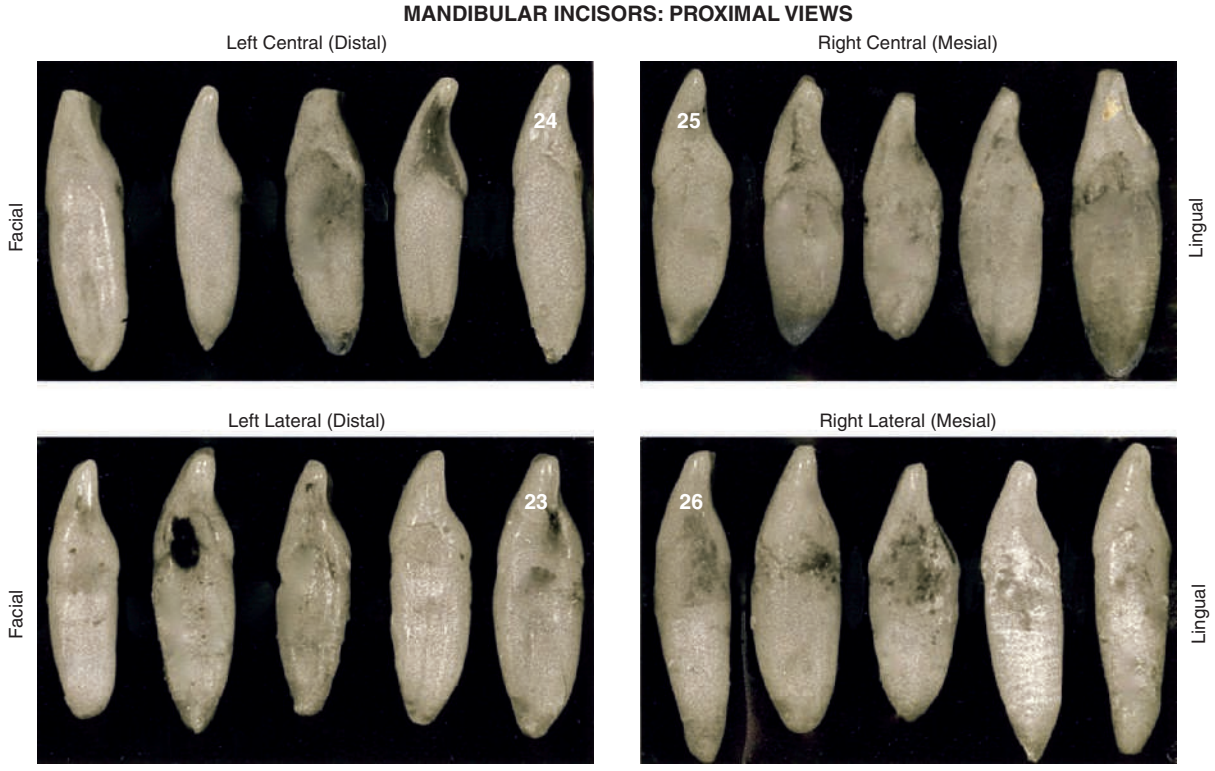
D. TYPE TRAITS OF MANDIBULAR INCISORS FROM THE INCISAL VIEW

To follow this description, the tooth should be held in such a position that the incisal edge is toward the observer, the labial surface is up, and the observer is looking exactly along the root axis line as in *Figure 2-26*. You will see slightly more of the labial than the lingual surface if the incisal ridge is just lingual to the root axis line.

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FIGURE 2-24. Mandibular central and lateral incisors, **proximal views**, with type traits that distinguish mandibular central from lateral incisors and traits that distinguish right and left sides.





TRAITS TO DISTINGUISH MANDIBULAR CENTRAL FROM LATERAL INCISOR: PROXIMAL VIEWS

CENTRAL INCISOR	LATERAL INCISOR
No distolingual twist	Distal of incisal ridge may be more lingual

TRAITS TO DIFFERENTIATE MANDIBULAR RIGHT FROM LEFT INCISOR: COMPARING PROXIMAL VIEWS

CENTRAL INCISOR	LATERAL INCISOR
Distal of incisal ridge even with mesial of incisal ridge	Distal of incisal ridge may be more lingual
Mesial cervical line curve greater than distal on both central and lateral incisors	

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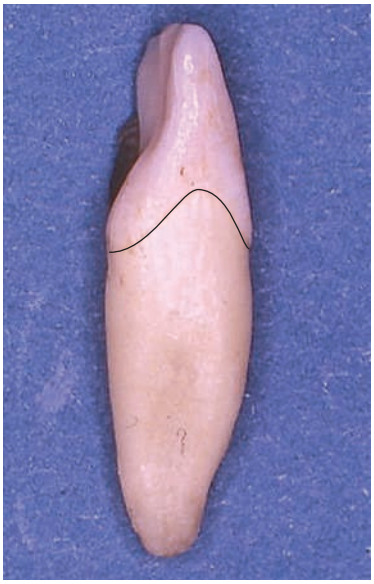


FIGURE 2-25. It is clear from the mesial view of this mandibular left lateral incisor that there is a pronounced **distolingual twist** (i.e., the distal portion of the incisal edge curves lingually) so that some of the lingual surface is visible from this mesial view. Also, notice the slight **root depression** on the mesial surface.

1. Crown Outline and Incisal Ridge Alignment on Mandibular Incisors (Incisal View)

The **mandibular central incisor** is practically bilaterally symmetrical with little to differentiate the mesial half from the distal half. The labial and lingual crests of curvature are centered, and the lingual crest of curvature is centered on the smooth, narrow cingulum. The thick (2 mm) incisal ridge of this symmetrical incisor runs in a straight line mesiodistally toward both contact areas and is at right angles to the labiolingual root axis plane.

The **mandibular lateral incisor** is not bilaterally symmetrical. If you align the incisal edge of the lateral incisor exactly horizontal, the cingulum of the mandibular lateral incisor is located distal to the mesiodistal midline (Appendix 2k). Recall that this was also seen on the *maxillary* central incisor. Looked at another way, if you were to align a **mandibular lateral incisor** with its lingual cingulum directed exactly downward or vertically (represented roughly by the dotted vertical line with the arrow in Appendix 2k), the distal half of the incisal edge would be perceived as twisted lingually (called a *distolingual twist*) (*Fig. 2-27*). This twist is evident in most mandibular lateral incisors in Figure 2-26 and is an excellent way to distinguish mandibular central from lateral incisors and to distinguish the right from left mandibular lateral incisors.

2. Incisal Ridge Is on or Lingual to Root Axis on Mandibular Incisors (Incisal View)

Incisal ridges of *both* types of mandibular incisors are on or lingual to the midroot axis. If you hold an extracted mandibular incisor with the root facing directly away from your sight line, slightly more of the labial than lingual surface would be visible if the incisal ridge is lingual to the root axis, especially on the distal half of mandibular lateral incisors due to the distolingual twist.

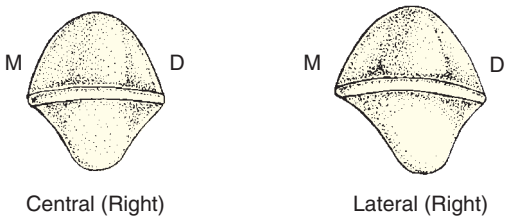
TABLE 2-4 Presence and Relative Depth of Longitudinal Root Depressions ("Root Grooves") on Incisors

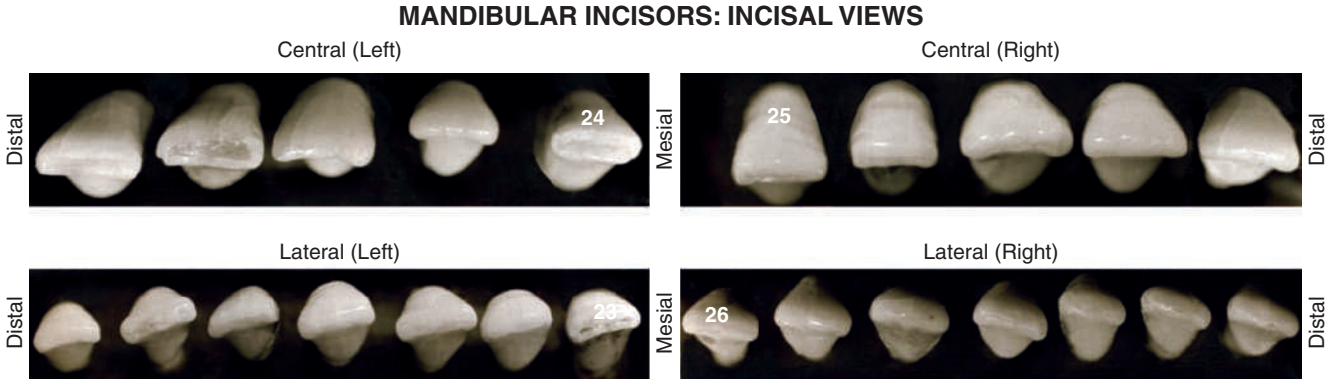
	TOOTH	MESIAL ROOT DEPRESSION?	DISTAL ROOT DEPRESSION?
MAXILLARY TEETH	Maxillary central incisor	Not likely	No (convex)
	Maxillary lateral incisor	Variable	No (convex)
MANDIBULAR TEETH	Mandibular central incisor	Yes	Yes (deeper)
	Mandibular lateral incisor	Yes	Yes (deeper)

General learning guidelines for incisors:
1. **Maxillary incisors** are not likely to have distal root depressions but could have mesial depressions.
2. **Mandibular incisors** usually have mesial and distal (deeper) root depressions.

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FIGURE 2-26. Mandibular central and lateral incisors, **incisal views**, with type traits that distinguish mandibular central from lateral incisors and traits that distinguish right and left sides.





TRAITS TO DISTINGUISH MANDIBULAR CENTRAL FROM LATERAL INCISOR: INCISAL VIEW

CENTRAL INCISOR	LATERAL INCISOR
No distolingual twist of incisal edge Cingulum is centered	Distolingual twist of incisal edge Cingulum is off center to distal

TRAITS TO DIFFERENTIATE MANDIBULAR RIGHT FROM LEFT INCISOR: INCISAL VIEW

CENTRAL INCISOR	LATERAL INCISOR
Very symmetrical: cannot tell right from left	Distolingual twist of incisal edge Cingulum is off center to distal

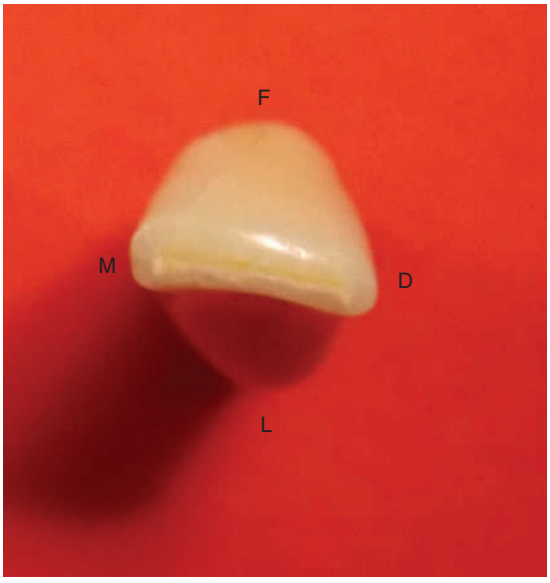


FIGURE 2-27. The **distolingual twist** of this right mandibular lateral incisor is quite evident.

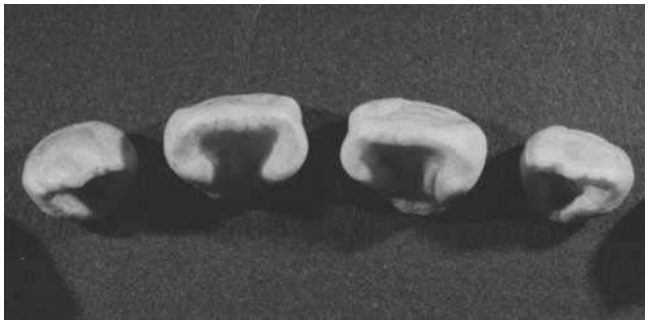


FIGURE 2-28. **Shovel-shaped** permanent incisors from a young Native American dentition (incisal views). Note the prominent marginal ridges on the *lingual* surface.

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SECTION VI INTERESTING VARIATIONS AND ETHNIC DIFFERENCES IN INCISORS

There is great morphologic variation in the maxillary lateral incisor. It may be missing altogether; it may resemble a small slender version of a maxillary central incisor; it may be quite asymmetrical; or it may be peg shaped (as seen later in the chapter on anomalies).

Racial differences in the maxillary incisor teeth have been reported in dental literature. **Shovel shape** is the term commonly used to designate incisor teeth that have prominent marginal ridges and a deep fossa on their lingual surfaces (*Fig. 2-28*). A high incidence of shovel-shaped incisors has been observed in Mongoloid people, including many groups of American Indians.[4,6,7,9] (**Mongoloid** pertains to a major racial division marked by a fold from the eyelid over the inner canthus, prominent cheekbones, straight black hair, small nose, broad face, and yellowish complexion. Included are Mongols, Manchus, Chinese, Koreans, Arctic coastal populations, Japanese, Siamese, Burmese, Tibetans, and American Indians.) White and black people are reported to have less frequent occurrences of this characteristic.

A study of the skulls of American Indians who lived in Arizona about 1100 AD has disclosed the occurrence of incisor teeth that have a mesial marginal ridge on the labial surface and a depression, or concavity, on the mesial part of the labial surface just distal to this ridge.[10] In these teeth, the distal part of the labial surface is rounded in an unusual manner. Such teeth have been referred to as "three-quarter double shovel shaped," a descriptive, if ponderous, term. Labial "shoveling" has also been reported in some Arctic coastal populations.

There is more uniformity of shape in the **mandibular incisor** teeth than in other teeth. In some Mongoloid people, the cingulum of mandibular incisors is characteristically marked by a short deep groove running cervicoincisally. This groove is often a site of dental caries.

Later, in the chapter on anomalies, you will read about more variations: peg-shaped incisors, fused mandibular incisors, congenitally missing central incisors, and even a lateral incisor merged distally to the canine.

LEARNING EXERCISE

Assign a Universal number to a handheld incisor:

Suppose a patient just had all of his or her permanent teeth extracted. Imagine being asked to find tooth 8 from among a pile of 32 extracted teeth on the oral surgeon's tray because you wanted to evaluate a lesion seen on the radiograph on the root of that incisor. How might you go about it? **Only after you have written down your own ideas**, then consider the following steps:

- From a selection of all permanent teeth (extracted teeth or tooth models), select only the incisors (based on **class traits**).
- Determine whether each incisor is maxillary or mandibular using arch traits. Review Table 2-2 if needed. You should never rely on only one characteristic difference between teeth to name them; rather, make a list of many traits that apply to a maxillary incisor, as opposed to only one trait that makes you think it belongs in the maxilla. This way, you can act as a detective and become an expert at recognition at the same time.
- Once you determine that the tooth is maxillary, position the root up; if it is mandibular, position the root down.
- Use appropriate traits in order to identify the facial surface. This will permit you to view the tooth as though you were looking into a patient's mouth.
- Next, using type traits, determine the type of incisor you are holding (central or lateral). Refer to the tables and teeth in the figures throughout this chapter as needed.
- Next, determine which surface is the mesial. Refer to figures throughout this chapter as needed. While viewing the incisor from the facial and picturing it within the appropriate arch (upper or lower), the mesial surface can be positioned toward the midline in only one quadrant, the right or left.
- Once you have determined the quadrant, assign the appropriate Universal number for the incisor in that quadrant. For example, the central incisor in the upper right quadrant is tooth 8.

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REVIEW Questions about Incisors

For each of the traits listed below, select the letter(s) of the permanent incisor(s) that normally exhibit(s) that trait. More than one answer may apply.

a. Maxillary central incisor
b. Maxillary lateral incisor
c. Mandibular central incisor
d. Mandibular lateral incisor

1. Mesiodistal dimension of the crown is larger than the labiolingual dimension.	a	b	c	d
2. The incisal ridge exhibits a distolingual twist.	a	b	c	d
3. The root is very narrow mesiodistally with mesial and distal root depressions.	a	b	c	d
4. The incisal edge is positioned more to the lingual of the root axis line.	a	b	c	d
5. The distal proximal crest of curvature is more cervical than the mesial height of contour.	a	b	c	d
6. This tooth has the widest (mesiodistally) incisor crown.	a	b	c	d
7. This tooth has the shortest root relative to its crown.	a	b	c	d
8. This tooth is the most symmetrical incisor.	a	b	c	d
9. This tooth has the largest curvature of the mesial cervical line.	a	b	c	d
10. This tooth has the narrowest incisor crown (mesiodistally).	a	b	c	d

ANSWERS: *1–a, b; 2–a, d; 3–c, d; 4–c, d; 5–a, b, d; 6–a; 7–a; 8–c; 9–a; 10–c*

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CRITICAL Thinking

1. The only way to master the many traits of the incisors presented in this chapter is to be able to picture each trait in your mind for each type of incisor and for each side of the mouth. Therefore, even though you have probably already looked carefully at each illustration in this chapter, at this time, reread the legends and study each figure in this chapter. If any facts are unclear, review the portion of the chapter that referred to that figure. Also, use the front and back of Appendix pages 1 and 2 to review all identified traits of incisors.
2. While you are recording which teeth are present in the mouth of Mrs. Jenny James, you notice that she has only three mandibular incisors. How might you determine which specific mandibular incisors are still present? Think of things you have learned about incisors, and try to recall facts you may already know about landmarks in the mouth.
3. Look at your mouth in the mirror while you place your anterior maxillary and mandibular teeth edge to edge, and align the arch midlines (the proximal contacts between central incisors) over one another. If your teeth are of average shape and alignment, notice that the distal outline of each maxillary central incisor extends distal to its opposing mandibular central incisor because the maxillary central is wider. Also, notice that the maxillary central incisors are wider and larger than the maxillary lateral incisors and that the maxillary central incisors and maxillary lateral incisors are wider than either the mandibular central or lateral incisors. Finally, note that the mandibular central incisors appear slightly narrower and smaller than the adjacent mandibular lateral incisors.
4. Using a good light source (like a small flashlight), a large mirror (magnifying if possible), and a small, clean disposable dental mirror, carefully compare the maxillary and mandibular incisors in your own mouth while referring to the traits in Table 2-2 from the **labial view** and **lingual view** that can be used to differentiate maxillary from mandibular incisors. Write down each trait that can be useful to differentiate the maxillary from the mandibular incisors **in your own mouth**, and also make note of any of the traits in the text book that do *not* apply in your mouth.
5. Perform a computer search for images of "**close-ups of celebrity teeth,**" and answer the following questions for at least five of the images. Remember that many of these celebrities have had major cosmetic dental work, so you may not be viewing their original teeth.
   a. Are their maxillary central incisors wider than their maxillary lateral incisors?
   b. Can you see evidence of formation from three facial lobes on any of their anterior teeth?
   c. Try to find at least one picture where you can see the mandibular incisors, and answer these questions. Are the mandibular incisors narrower than the maxillary incisors? Are their mandibular centrals narrower than the laterals? Do you see any spaces (diastemas) between teeth? If not, try looking for images of Madonna, the early years, for the diastema between her central incisors (which she had closed during her later years).
6. Search the Internet for images of "**orthodontics before and after,**" and answer the same questions as in exercise #4 above for the "before" pictures and for the "after" pictures.

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Dr. Woelfel's Original Research Data

Statistics obtained from Dr. Woelfel's original research on teeth have been used to draw conclusions throughout this chapter and were referenced with superscript letters that refer to the data stated here. Data from his original research are presented in *Tables 2-5A and 2-5B*.

A. The crown of the maxillary central incisor averages 11.2 mm long incisocervically, making it the longest incisor crown. This crown averages 2.6 mm longer incisogingivally than mesiodistally.
B. The crown of the maxillary lateral incisor averages about 2.0 mm narrower mesiodistally than on the central incisor, and the root is 0.4 mm longer.
C. The maxillary lateral incisor root is 0.4 mm longer than on the maxillary central. The average root-to-crown ratio for 295 maxillary lateral incisors was 1.37. The average root-to-crown ratio for 398 maxillary central incisors was 1.16.
D. The maxillary central incisor root at the cervix averages about 6.4 mm wide mesiodistally and faciolingually.

TABLE 2-5A Size of Maxillary Incisors (Millimeters)

	398 CENTRALS		295 LATERALS	
DIMENSION MEASURED	AVERAGE	RANGE	AVERAGE	RANGE
Crown length	11.2 longest incisor crown	8.6–14.7	9.8	7.4–11.9
Root length	13.0	6.3–20.3	13.4	9.6–19.4
Overall length	23.6	16.5–32.6	22.5	17.7–28.9
Root-to-crown ratio	1.16		1.37	
Crown width (mesiodistal)	8.6	7.1–10.5	6.6	5.0–9.0
Root width (cervix)	6.4	5.0–8.0	4.7	3.4–6.4
Faciolingual crown size	7.1	6.0–8.5	6.2	5.3–7.3
Faciolingual root (cervix)	6.4	5.1–7.8	5.8	4.5–7.0
Mesial CEJ curve	2.8 greatest CEJ curve	1.4–4.8	2.5	1.3–4.0
Distal CEJ curve	2.3	0.7–4.0	1.9	0.8–3.7

TABLE 2-5B Size of Mandibular Incisors (Millimeters)

	226 CENTRALS		234 LATERALS	
DIMENSION MEASURED	AVERAGE	RANGE	AVERAGE	RANGE
Crown length	8.8	6.3–11.6	9.4	7.3–12.6
Root length	12.6	7.7–17.9	13.5	9.4–18.1
Overall length	20.8	16.9–26.7	22.1	18.5–26.6
Crown width (mesiodistal)	5.3 narrowest adult crown	4.4–6.7	5.7	4.6–8.2
Root width (cervix)	3.5	2.7–4.6	3.8	3.0–4.9
Faciolingual crown size	5.7	4.8–6.8	6.1	5.2–7.4
Faciolingual root (cervix)	5.4	4.3–6.5	5.8	4.3–6.8
Mesial CEJ curve	2.0	1.0–3.3	2.1	1.0–3.6
Distal CEJ curve	1.6	0.6–2.8	1.5	0.8–2.4

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All other types of maxillary teeth have roots that are thicker faciolingually than mesiodistally by 1.1 to 3.4 mm.

E. Dr. Woelfel examined the maxillary incisors on casts of 715 dental hygiene students and found that 32% of the central incisors and 27% of the lateral incisors have some degree of shoveling. The rest had smooth concave lingual surfaces without prominent marginal ridges or deep fossae.

F. Inspection of 506 maxillary central incisors by Dr. Woelfel revealed 36% with no accessory lingual ridges, 27% with one small ridge, 28% with two accessory ridges, 9% with three ridges, and only three teeth with four small ridges.

G. Inspection of 488 maxillary lateral incisors by Dr. Woelfel revealed 64% with no lingual accessory lingual ridges, 32% with one small accessory ridge, and only 4% with two ridges.

H. The largest curvature of a proximal cervical line averages 2.8 mm on the mesial of a maxillary central incisor, and the distal curve is only 2.3 mm. The curvature of the mesial of the maxillary lateral incisor averages 2.5 mm or one fourth of the crown length.

I. The crown of the maxillary central incisor averages 1.5 mm wider mesiodistally than faciolingually. The crown of the maxillary lateral incisor averages only 0.4 mm wider mesiodistally than faciolingually.

J. The narrowest tooth in the mouth is the mandibular central incisor and averages only five eighths, or 62% as wide as the maxillary central incisor.

K. Dr. Woelfel found two shallow labial developmental depressions on 48% of 793 mandibular central incisors and on 51% of 787 mandibular lateral incisors.

L. The root-to-crown ratio for both types of mandibular incisors is 1.43 compared to 1.16 for the maxillary central incisor and 1.37 for the maxillary lateral.

M. The curve of the CEJ on the mesial of the mandibular central incisor averaged 2.0 mm, which is 0.4 mm greater than on the distal. On the mandibular lateral incisor, the mesial CEJ curvature is 0.6 mm greater than the distal.

N. The cervix of the root of the both types of mandibular incisor averages 2.0 mm wider faciolingually than mesiodistally.

O. Both types of mandibular incisor crowns average 0.4 mm wider labiolingually than mesiodistally.

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