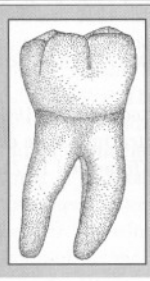
CHAPTER 4



INITIATING ENDODONTIC TREATMENT

Franklin S. Weine, with new access photos by Arturo Ventura Morales

CHAPTER OUTLINE

Rules for Proper Access Preparation
Common Canal Configurations
- Canal configuration studies
- Types of configurations

Armamentarium for Access Preparations
Pulp Canal Anatomy and Access Preparations
- Maxillary central incisor
- Maxillary lateral incisor
- Maxillary cuspid
- Mandibular central and lateral incisors
- Mandibular cuspid
- Maxillary first bicuspid
- Maxillary second bicuspid
- Mandibular first bicuspid
- Mandibular second bicuspid
- Maxillary first molar
- Names of canals in mesiobuccal root
- Maxillary second molar
- Mandibular first molar
- Mandibular second molar

General Shape of Walls in Access Preparations
- Removal of obstructions to the apex
- Need for divergent walls
- Access for badly worn or fractured anterior teeth

Preparation of Area for Treatment
- Need for local anesthesia during endodontic therapy
- Pain and nerve pathways
- Types of anesthetic solutions used in endodontics
- Injections needed for removal of vital pulp tissue
- Special comments about mandibular block injections
- Intraligamentary anesthesia
- Application of rubber dam for severely broken-down teeth

After the establishment of a diagnosis and treatment plan, the first part of treatment directly applied to the tooth is the access cavity preparation. Although this portion of therapy is the first that actually penetrates the tooth, there are still a few procedures that must be accomplished prior to picking up the handpiece. As discussed in Chapter 2, at least two accurate radiographs must be taken, after which the probable canals configuration(s) are calculated. In many cases, some local anesthetic will be administered, and perhaps, some supplementary injections are used (see later in this chapter). A well-positioned rubber dam must be placed (comfortable for the patient and useful for the operator), although that may follow the start of the access.

It has already been emphasized that canal preparation is the most important segment of endodontic therapy. Canal preparation may be divided into two phases: the coronal portion and the intraradicular (within the root) portion. The coronal phase, which is the access cavity, must give direct access to the root canals and the apical foramina so that these areas may be properly cleaned and shaped by the intraradicular phase. Therefore all the treatment that follows hinges on the accuracy and correctness of the entry. If the access is improperly prepared as to position, depth, or extent, it will be difficult to reach an optimal result.

RULES FOR PROPER ACCESS PREPARATION

To ensure that the most efficient access cavity is prepared, the following rules should be observed.

1. *The objective of entry is to give direct access to the apical foramina, not merely to the canal orifices.* Because it is the apical foramen of each canal that must be sealed, the access cavity must allow for removal of any tooth structure that might impede the preparation and filling of that area. For that reason, the access cavity preparations suggested in this chapter may deviate slightly from those

recommended by some other writers, whose main considerations were directed at the opening of the orifices.

2. *Access cavity preparations are different from typical operative occlusal preparations.* The typical occlusal cavity preparations used in operative dentistry are based on the topography of occlusal grooves, pits, and fissures and on the avoidance of underlying pulp. The access cavity preparations for endodontic therapy are designed for efficiently uncovering the roof of the pulp chamber and providing direct access to the apical foramina by way of the pulp canals. Because the two types of preparations must satisfy different criteria, it is only natural that they have differing configurations. By the same token, any attempt to use an operative cavity preparation as an endodontic access without considerable modification will greatly complicate the treatment. The appropriate access cavity preparations suggested later in this chapter should be reviewed before endodontic therapy on any tooth is begun, until they become familiar to the operator.
3. *The likely interior anatomy of the tooth under treatment must be determined.* Each tooth has a typical length, number, and configuration of roots and canals, as listed in Tables 4-1 to 4-3. Before starting the access, radiographs taken from at least two different angles must be studied. Knowing what combinations of interior anatomy are possible and having the information given by the radiographs, the operator will be able to ascertain with great accuracy the canal system present in the tooth to be treated and the possible alternative configurations. This information gained before initiation of preparation will greatly facilitate the entry as well as further treatment.
4. *When canals are difficult to find, the rubber dam should not be placed until correct location has been confirmed.* It is often difficult to prepare access in a malposed tooth or one that is part of a bridge or splint. The occlusal anatomy, which ordinarily gives excellent clues to the position of the underlying canals, may be considerably altered. Teeth with large and/or deep restorations causing heavy dentinal sclerosis also may cause problems. Therefore, in such teeth, it is best to make the initial portion of the access preparation before the placement of the rubber dam so that the shape and inclination of the adjacent teeth, the gingival tissues, and the hard structures covering the roots are of aid in determining the position of the canals. In addition, if the tooth to be treated is part of a bridge or splint, water spray may be used to keep the adjacent abutments from overheating until the gold is penetrated.

Once the roof of the chamber is penetrated and the correct access is verified, the rubber dam may be applied. Because the canals will be enlarged considerably with heavy irrigation, the effect of any microorganism contamination before dam place-



TABLE 4-1 Typical Tooth Lengths, Number of Roots, and Canal Configuration for Anterior Teeth*

Tooth	*Total Length*	*Crown Length*	*Root Length*	*Number of Roots*	*Types of Canals*
Maxillary central incisor	A = 23.0	10.5	12.5	One	I
	L = 28.0	12.0	16.0		
	S = 18.0	8.0	8.0		
Maxillary lateral incisor	A = 22.5	9.0	13.5	One	I
	L = 27.0	10.5	16.5		
	S = 17.0	8.0	8.0		
Maxillary cuspid	A = 27.0	9.5	16.5	One	I
	L = 32.0	12.0	20.5		
	S = 20.0	8.0	11.0		
Mandibular incisor	A = 21.0	9.0	12.0	One	I most frequent
	L = 25.0	10.5	14.5		II less frequent
	S = 16.0	7.0	9.0		III least frequent
Mandibular cuspid	A = 24.0	10.0	15.0	One; two, buccal and	I most frequent
	L = 30.5	12.0	20.5	lingual, rare	II less frequent
	S = 20.0	8.5	11.5		III least frequent

*Tables 4-1 to 4-3 present data from more than 9000 cases from my private practice. Working lengths for each tooth with a normal or restored crown were compiled. The average length *(A)* was the measurement from the cusp tip to apex of the median tooth; the long length *(L)* was the measurement of the tooth at the 95th percentile; the short length *(S)* was the measurement of the tooth at the fifth percentile. The lengths of the root and crown were derived from Black's *Descriptive Anatomy of the Human Teeth.*



TABLE 4-2 Typical Tooth Lengths, Number of Roots, and Canal Configuration for Bicuspids*

Tooth	*Total Length*	*Crown Length*	*Root Length*	*Number of Roots*	*Types of Canals*
Maxillary first bicuspid	A = 21.0	8.5	12.5	Two most frequent (60%), buccal and palatal	Each I
	L = 24.0	10.0	14.5		
	S = 17.5	7.0	10.0	One (40%)	III most frequent
					II less frequent
					I rare
				Three rare	Each I
Maxillary second bicuspid	A = 21.0	8.5	12.5	One (85%)	I most frequent
	L = 25.0	10.5	15.0		II less frequent
	S = 17.0	7.0	9.5		III least frequent may have Type IV at apex
				Two (15%), buccal and palatal	Each I
Mandibular first bicuspid	A = 21.5	7.5	14.0		
	L = 25.0	9.0	17.0	One	See Table 4-5.
	S = 17.0	6.5	11.5		
				Two, buccal and lingual, rare	Each I
Mandibular second bicuspid	A = 22.0	8.0	14.0	One	I most frequent
	L = 25.0	10.0	17.0		II or III rare
	S = 17.0	6.0	11.5		IV very rare
				Two, buccal and lingual, very rare	Each I
				Three, two buccals and one lingual, extremely rare	

*See Table 4-1 for explanation of terms.

ment is minimal. Under no circumstance should a file, reamer, or broach be used until the dam is securely in place.

If for some reason it is mandatory to use the rubber dam for every phase of treatment, the access cavity for complex cases should be prepared with multiple-tooth rather than single-tooth isolation. This will allow for visualization of adjacent teeth while the dam is in place (Figure 4-1).

5. *Endodontic entries are prepared through the occlusal or lingual surface—never through the proximal or gingival surface.* In an attempt to be conservative, the dentist may elect to perform endodontic therapy through an already existing proximal or gingival restoration or carious lesion. When this is done, the canal-enlarging instruments must be bent at severe angles to pass through the access and still perform their function. Inadequate canal preparation and/or broken instruments may result.

   When proximal or gingival tooth destruction occurs, affected areas should be excavated and restored, with either a temporary seal or a permanent filling material. Then the normal access cavity is prepared through the occlusal or lingual surface, as described later in this chapter.

6. *As part of the access preparation, the unsupported cusps of posterior teeth must be reduced.* Endodontic therapy requires the removal of much of the central portion of the treated tooth, greatly reducing resistance to stress. Although this problem is solved by the placement of a proper restoration after treatment, the tooth is severely weakened until that time. Therefore, as part of access preparation, all unsupported cusps must be reduced by trimming with a tapered fissure carbide or diamond stone until a definite clearance in occlusal and lateral movement is obtained. This decreases the chance for cuspal fracture beneath the gingival or bony attachment, which is so difficult to repair, or vertical fracture of the root, which is hopeless!

COMMON CANAL CONFIGURATIONS

Although the apical foramen must be sealed by endodontic therapy, the root canal is what provides the pathway to the apex. Therefore it is important for the dentist to be familiar with the various paths that the route takes in getting to the apex. These are the typical configurations of the root canals.

TABLE 4-3 Typical Tooth Lengths, Number of Roots, and Canal Configuration for Molars*

Tooth	*Total Length*	*Crown Length*	*Root Length*	*Number of Roots*	*Types of Canals*
Maxillary first molar	A = 20.5	7.5	13.0	Three, two buccal and one palatal	Distobuccal and palatal: each I
	L = 24.5	9.0	16.0		Mesiobuccal: see Table 4-4.
	S = 17.0	7.0	10.0		
Maxillary second molar	A = 20.0	7.0	13.0	Three, two buccal and one palatal (90%)	Distobuccal and palatal: each I
	L = 24.0	8.5	15.5		Mesiobuccal: see Table 4-7.
	S = 17.0	7.0	10.0	Two, one buccal and one palatal (10%)	Each I most frequent; buccal root may have II or III infrequently
Mandibular first molar	A = 21.0	7.5	13.5	Two most common, mesial and distal	Mesial: III most frequent II less frequent
	L = 24.5	10.0	15.0		Distal: I most frequent II less frequent III least frequent
	S = 18.0	6.0	11.5		
				Three, one mesial and two distal	Mesial: same as above Distal: each I, distolingual very curved
Mandibular second molar	A = 20.0	7.0	13.0	Two most common, mesial and distal	See Table 4-6. Distal: I most frequent II or III rare
	L = 24.0	8.5	15.5		
	S = 17.0	6.0	12.0		
				One	II most frequent I less frequent III least frequent

*See Table 4-1 for explanation of terms.

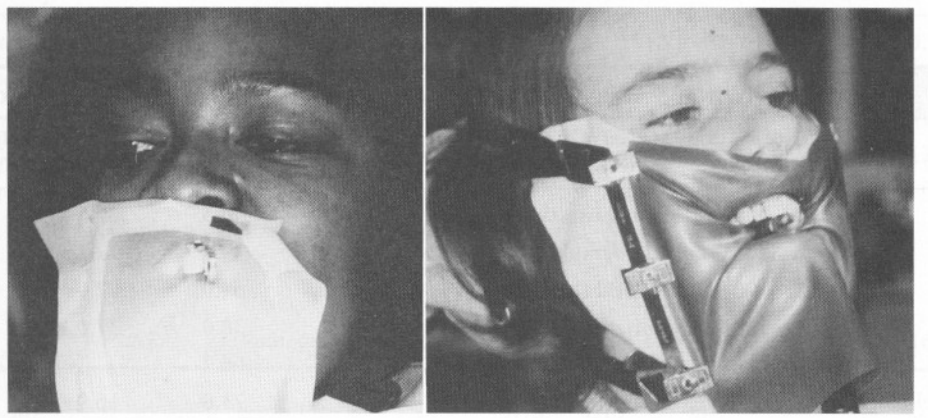


FIGURE 4-1 **Types of rubber dam applications. A,** Single-tooth isolation for maxillary central incisor, using an Ostby frame. **B,** Multiple-tooth isolation from maxillary first bicuspid to opposite first bicuspid, using a Woodbury frame.

Canal Configuration Studies

For many years the standard works of referral for this subject had been the canal morphology studies published in the first third of the twentieth century. Hess, in particular, published several reports demonstrating huge numbers of pulpal vessels with intricate curvatures, anastomoses, and junctions, which were rarely recapitulated by canal fillings of that period. Wheeler also published several textbooks dealing with this subject.

It is obvious that canal anatomy in human teeth has not changed for hundreds, if not thousands, of years. However, for some inexplicable reason, many of these early studies proved to be inaccurate. Then, in 1965, Rankine-Wilson and Henry, with their study club in Perth, Australia, published an illuminating report on the canal anatomy of mandibular anterior teeth. Many dentists were

shocked at the frequency of two canals in mandibular incisors according to that study, and few really placed credence in the findings. However, because the mandibular anterior teeth were not often endodontically involved, the information did not have much impact clinically.

The Rankine-Wilson and Henry paper did serve to stimulate further research into the canal anatomy of the more frequently treated teeth, particularly in those instances where a lesser degree of success than anticipated was obtained. Rankine-Wilson, a restorative dentist who learned to do his own endodontic treatment for his rehabilitation cases because of the absence of endodontic specialists then practicing in Perth, came to the United States in 1967 to teach at Northwestern University Dental School for 1 year in the Crown and Bridge Department. Weine, a young endodontist recently out of his master's program and also teaching at Northwestern, and Rankine-Wilson became fast friends and discussed possible future studies on canal configuration. Both agreed that the mesiobuccal root of the maxillary first molar had many more failures than could be anticipated, particularly in cases where postoperative inspection of the radiographs indicated reasonably well-treated cases.

The result of these discussions was the paper by Weine et al in 1969, indicating that four canals were present in that tooth more often than three canals (51.5% versus 48.5%). Many teachers and clinicians ridiculed that study and claimed that the results were contrived and inaccurate. However, since 1969, a number of investigators have studied that root by various methods, essentially substantiating the results of the Weine study (Table 4-4), with several stating an even greater occurrence for four canals in that tooth.

Once that study, as surprising as it was, had been verified, the dam was broken, and many other teeth or roots were investigated, with new and significant information reported. Such teeth as the mandibular first bicuspid (Table 4-5), the mandibular first and second molars (Table 4-6), and the maxillary second bicuspid and molar (Table 4-7) were the objects of illuminating studies. The net results of these reports were that many, many more teeth were treated successfully than had been previously, and when treatment was not successful, an intelligent assessment of failure and possible re-treatment could be reached.

Types of Configurations

Despite the many combinations of canals that are present in the roots of the 32 permanent teeth, it is possible to categorize the canal systems in any one root into four different types (Figure 4-2). These four types can be described briefly.

Type I—single canal from the pulp chamber to the apex

Type II—two separate canals leaving the chamber but merging short of the apex to form only one canal

Type III—two separate canals leaving the chamber and exiting the root in separate apical foramina



TABLE 4-4 Canal Configuration Studies for the Mesiobuccal Root of the Maxillary First Molar

Author(s)	*No. of Teeth*	*Method of Study*	*Type I (%)*	*Type II (%)*	*Type III (%)*	*Type IV (%)*
Weine et al.	208	Vertical sectioning	48.5	37.5	14.0	0
Pineda and Kuttler	262	Radiographic	39.3	12.2	35.7	12.8
Green**	100	Vertical sectioning	64.0	22.0	14.0	
Seidberg et al.	100	Horizontal sectioning	38.0	37.0	25.0	
		Clinical cases	66.7	←33.3→		0
Pomeranz and Fishelberg	71	Decalcified and dyed	71.8	16.9	11.3	0
	100	Clinical cases	69.0	16.0	15.0	0
Vertucci	100	Decalcified and dyed	45.0	37.0	18.0	
Evenot	170, 208	Radiographic, several microscopic	28.8	23.5	38.8	8.8
Hartwell and Bellizzi	538	Clinical cases	81.4	←18.6→		0
Weller and Hartwell	835	Clinical cases	61.0	←39.0→		0
Weine et al.	300	Radiographic, files in extracted teeth	42.0	24.2	30.4	3.4
Stropko*	1732	Clinical cases	16.5	31.9	44.3	—
Wolcott et al.**	1193	Clinical cases, initial cases			←58.8→	
		Clinical cases, retreatments			←67.4→	

*Mesiobuccal root studied in maxillary first, second, and third molars, only 72/92 four-canaled teeth could be instrumented.

**Mesiobuccal root studied in first and second molars.

TABLE 4-5 Canal Configuration Studies for the Mandibular First Bicuspids

Author(s)	No. of Teeth	Method of Study	Type I (%)	Type II (%)	Type III (%)	Type IV (%)	Three Canals
Pineda and Kuttler	202	Radiographic	69.3	4.9	1.5	23.4	0.9
Green	50	Vertical sectioning	86.0	4.0	←10.0→		Not reported
Vertucci	400	Decalcified and dyed	70.0	4.0	1.5	24.0	0.5
Baisden et al.	106	Transverse sectioning	76.4	0	0	23.6	0

TABLE 4-6 Canal Configuration Studies for Mesial Root of Mandibular Second Molar

Author(s)	No. of Teeth	Method of Study	Type I (%)	Type II (%)	Type III (%)	Type IV (%)
Green	100	Vertical sectioning	13.0	49.0	38.0	0
Pineda and Kuttler	300	Radiographic	58.0	20.6	13.8	7.6
Vertucci	100	Decalcified and dyed	27.0	38.0	26.0	9.0
Weine et al.	72	Radiographic with files in place	4.0	52.0	40.0	0

TABLE 4-7 Canal Configuration Studies for Mesiobuccal Root of Maxillary Second Molar

Author(s)	No. of Teeth	Method of Study	Type I (%)	Type II (%)	Type III (%)	Type IV (%)
Nosonowitz and Brenner	161	Clinical cases	68.9	25.5	5.6	0
Pomeranz and Fishelberg	29	Clinical cases	62.1	13.8	24.1	0
Pineda and Kuttler	294	Radiographic	64.6	8.2	12.8	14.4
Vertucci	100	Decalcified and dyed	71.0	17.0	12.0	0
Kulild and Peters	32	Access and bur penetration	21.8	←78.2→		0
	32	Sectioning and microscopic	6.3	←93.7→		0
Wolcott et al.	680	Clinical cases, initial cases	—	←35.3→		—
		Clinical cases, retreatments	—	←43.6→		—
Eskoz and Weine	67	Radiographic with files in place	59.7	20.9	16.4	3.0

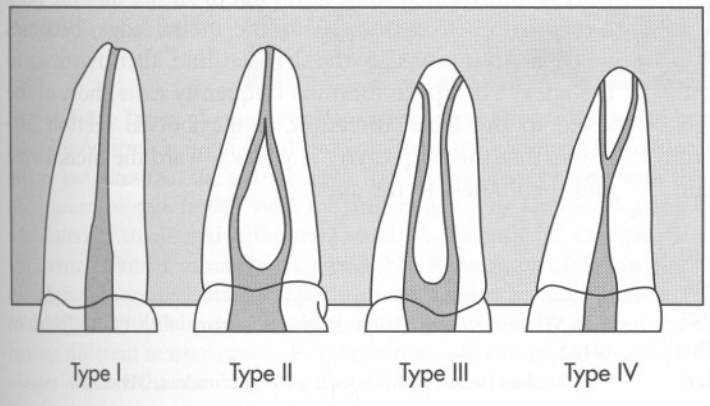


FIGURE 4-2 Four possible types of canal configuration present in one root are shown: *Type I*—single canal from pulp chamber to apex; *Type II*—two canals leaving the chamber and merging to form a single canal short of the apex; *Type III*—two separate and distinct canals from chamber to apex; *Type IV*—one canal leaving the chamber and dividing into two separate and distinct canals.

Type IV—one canal leaving the pulp chamber but dividing short of the apex into two separate and distinct canals with separate apical foramina

Canal preparation of Type I and Type III canal systems is relatively straightforward because each of the canals in these configurations is separate and distinct between orifice and apex. The only difference between the two is that the Type III system has two canals, whereas the Type I has only one.

However, Type II and Type IV systems are different because there are some areas in the root where the two canals share space and others where the canals are separate. This requires individualized procedures in each of these conditions to obtain the most desirable results. Methods for preparing, as well as filling, Type II and Type IV systems are discussed in Chapter 5.

Vertucci has written extensively about canal anatomy and established a somewhat different classification, with seven major types rather than four. Some of his types are merely variants of those just listed, such as a single canal that divides in midroot but then remerges into one canal (considered to be Type I in this classification) or two canals leaving the floor of the chamber separately, merging in midroot and then separating into two canals as they exit the tooth (considered to be Type III in this classification).

Periodically a configuration is seen that is not specifically described in the classification used in this textbook, but this is a very rare occurrence (Figure 4-3). I doubt that those types that fail to be described accurately with my classification occur any more frequently than 0.1%, if that often. Learning a larger number of configurations for such a minuscule number of cases seems unwarranted.

Vertucci did his studies by collecting extracted teeth with minimal decay or restorations, decalcifying the hard tissues, removing the pulpal contents, and injecting dye into those spaces. These transparent specimens were designed to be viewed by students and dentists interested in pulpal anatomy. Most teeth requiring endodontic treatment have had considerable decay and/or are highly restored. My classification is based on teeth that I have treated, specifically as recorded on radiographs taken during and after endodontic therapy. Both systems are important and deserve attention, but my choice is to use a simple and directly clinically oriented classification.

This classification does not consider the possible position of large auxiliary canals or the position at which the apical foramina exit the root. Any combination of these factors could be present in any of the canals without regard to any specific configuration.

In Tables 4-1 to 4-3 this classification is used to describe the canal configurations present in each root. Extremely unusual root and canal configurations were not considered in the compilation of data for these tables. The figures listed are those that are applicable to needed treatment in the greatest number of cases. Although no exact percentages are given for the possible combinations, the following terms have been used to indicate the frequency of occurrence:

Most frequent—present in more than 55% of cases
Less frequent—present in less than 45% but more than 25% of cases
Least frequent—present in less than 25% but more than 2% of cases
Rare—occurring in less than 2% of cases but still present occasionally

ARMAMENTARIUM FOR ACCESS PREPARATIONS

The tray setup for access preparations is shown in Figure 4-4. Instruments to be included are listed in Box 4-1.

Rubber dam materials also must be available for this appointment, including sheets of rubber dam, punch, frame, clamp holder, and clamps. Clamps needed are as follows.

Nos. 26* and 27*—wingless clamps for molars or
Nos. 12A** and 12B**—winged clamps for molars
No. 209*—for bicuspids and bulky anterior teeth
No. 211* or 9*—for small anterior and broken down teeth, or a similar assortment

In addition, temporary filling materials and intracanal medicaments must be available (see Chapter 5). The dental operating microscope or other systems for visualization are important aids to locate canals, as well, and are discussed in Chapter 9.

PULP CANAL ANATOMY AND ACCESS PREPARATIONS

Maxillary Central Incisor

The maxillary central incisor always has one root and Type I canal configuration. The root is bulky, with a slight distal axial inclination but rarely has a dilaceration. The typical length measurements are given in Table 4-1.

A labiolingual section of the tooth shows that the pulp cavity comes to a point near the incisal edge, becomes wider as it approaches the cervical line, then narrows to the apex. The apical foramen frequently exits short of the apex, to the labial direction. A mesiodistal section discloses that the pulp cavity is wider toward the incisal area and then tapers to the apex.

*S.S. White-Pennwalt Dental Products International, Philadelphia, PA 19102

**Columbus Dental Manufacturing Co., Columbus, OH 43206

The access cavity preparation is begun by using a tapered fissure bur in the exact center of the lingual surface. The bur should be directed parallel to the long axis of the crown, rather than at a right angle, as has been suggested. If the access is begun at a right angle to the long axis, there is a possibility for penetration too far labially, or for completely missing the pulp canal on a tooth with considerable dentinal sclerosis. On the other hand, penetration along the long axis in the center of the tooth must eventually reach the canal (Figure 4-6). The philosophy of right-angle penetration is a holdover from the era preceding the use of high-speed instruments, when it was difficult to penetrate enamel with slow speed using steel burs. With an airotor and carbide burs, direct penetration offers no problem. Access for each anterior tooth should be prepared in this manner (Figure 4-7).

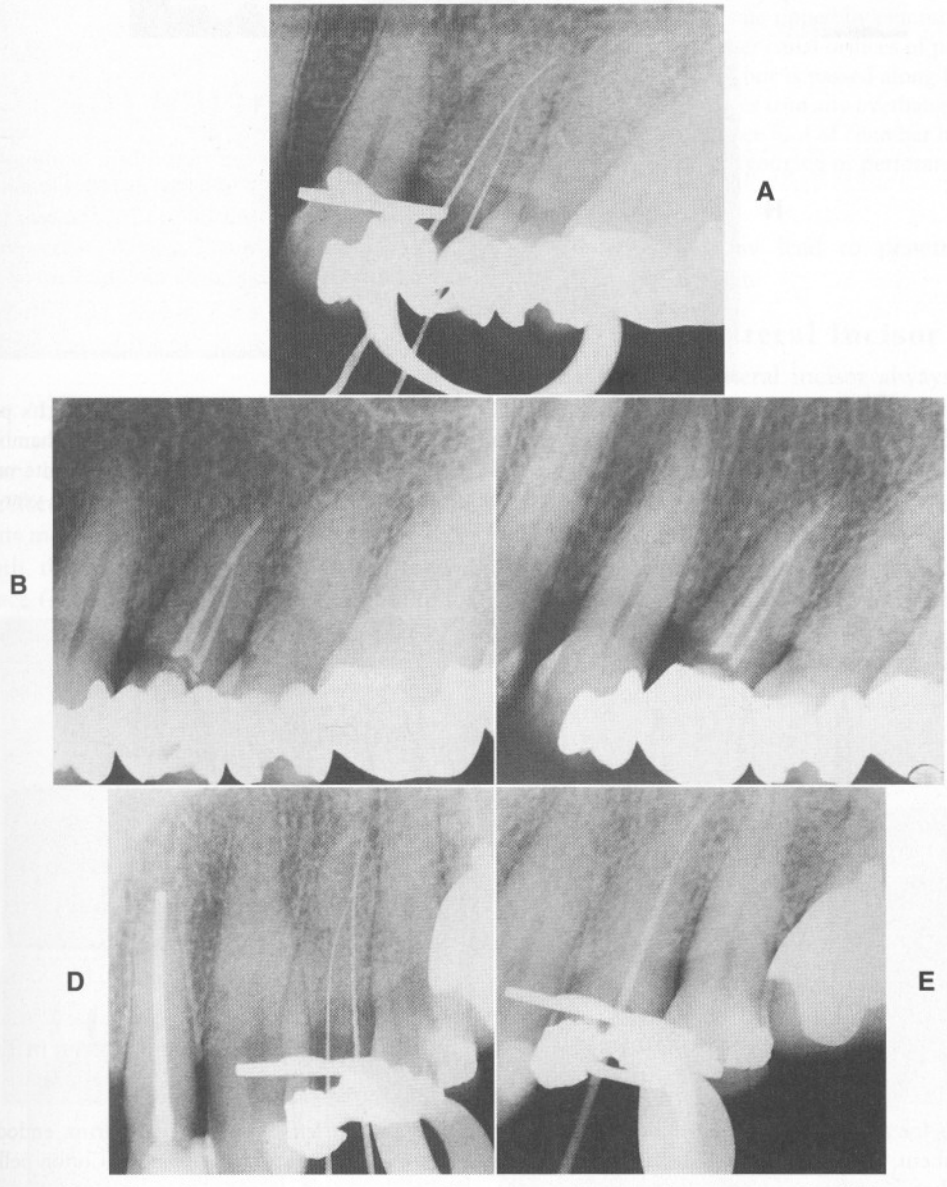


FIGURE 4-3 **Types of canal configurations that appear the same at the start but prove to be different. A,** Radiograph of files in place for determination of canal configuration and working length calculation for a maxillary first bicuspid. This angled view from the mesial indicates that the palatal canal *(left)* is the master canal, with the buccal canal merging into it—clearly a Type II canal system. As also can be seen in this view, the orifices are quite far apart leaving the chamber but still merge short of the apex. **B,** Canals filled with laterally condensed gutta-percha and Wach's paste. **C,** One year later, after restoration, normal periapical tissue. (Restorations by Dr. Irving Fishman, formerly of Chicago.) **D,** Radiograph of files in place for determination of canal, configuration, and working length calculation of another first bicuspid, also angled view from the mesial. The canal to the right (the buccal) is the master canal, according to this film, with the palatal canal merging into it—clearly another Type II canal system, very similar to that shown in view *A,* except having different master canals. **E,** Preparation was completed as a Type II configuration, with one master gutta-percha canal placed as master canal in the buccal canal.

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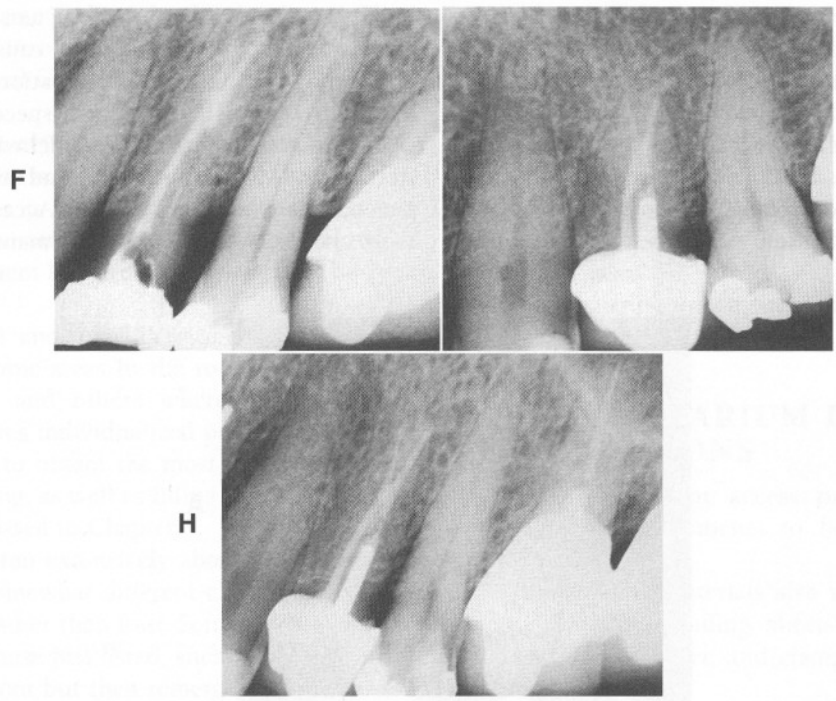


FIGURE 4-3, cont'd **F,** Immediate postfilling film, canals filled with laterally condensed gutta-percha and Wach's paste, post room prepared in buccal canal. It is obvious now that the canal configuration was of two canals exiting the floor of the chamber, merging into a single canal, and then redividing into two separate canals to exit at the apex. This type of configuration is quite unusual but does occur occasionally. It is neither Type II nor Type IV and, in fact, is not covered in the classification given. **G,** One year after treatment. **H,** Two years after treatment, periapical areas remain normal. (Restorations by Dr. Charles Greene, Skokie, Ill.)

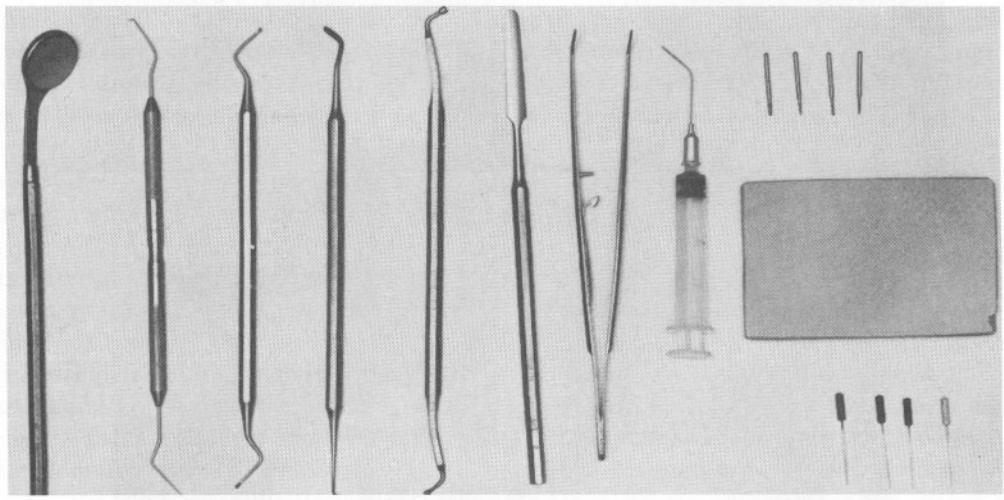


FIGURE 4-4 Tray setup for access cavity preparation and canal preparation. *From left,* Front surface mirror, endodontic explorer, excavator, plastic instrument, amalgam plugger, spatula, cotton pliers, irrigating syringe. *At right, from top,* Cotton pellets, long shank burs, mixing slab, broaches.

A cross section of the tooth in the cervical area shows that the canal has a slightly triangular shape, with the apex toward the lingual surface and the base to the labial. For that reason, the entry has a round but slightly triangular shape to give direct access to the entire canal (Figure 4-8).

Once the canal is found, a safe-tipped tapered fissure bur is used to remove any dentin overhangs that would trap debris, sealer, or other materials, which might cause crown discoloration or prevent direct access to the apex. This procedure is followed in all anterior teeth, both maxillary and mandibular.



BOX 4-1
INSTRUMENTS FOR ACCESS PREPARATION TRAY SETUP

Front surface mirror—for best visibility
Endodontic explorer—one end comes to a point to aid in locating orifices, whereas the other has a slight hook to check shelves at edges of the preparation
Endodontic excavator—to remove decay and pulp tags
Plastic instrument
Amalgam plugger
Spatula
Cotton pliers
Broaches
Glass slab
Cotton pellets—to hold medication and absorb blood
Burs—long shank, no. 701 or 558, no. 4, no. 2, and a specially prepared no. 701 or 558 with a rounded or safe-tipped end to prevent gouging (Figure 4-5); safe-tipped burs only to be used on floor of the pulp chamber after penetration of roof

The maxillary central and lateral incisor and canine roots, and therefore canals as well, all have a distal axial inclination. This means that in penetrating along the long axis of the tooth, the bur must be slightly angled toward the distal surface (see Figure 4-7). Failure to provide for this situation may lead to penetration of the mesial portion of the root.

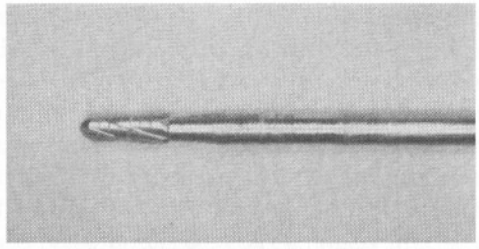


FIGURE 4-5 Rounded or safe-tipped bur. Cutting flutes are present on sides but not tip of bur. Any fissure bur may be altered to become safe tipped by trimming flutes from end with a heatless stone. After canal orifices of posterior teeth have been located, safe-tipped bur is passed along floor of chamber so that cutting flutes on sides trim any overhanging dentin to give direct access to canals. Once roof of chamber has been penetrated, use of this bur prevents gouging or perforation of the floor.

Maxillary Lateral Incisor

The maxillary lateral incisor always has one root and a Type I canal configuration. The root is more slender than in the maxillary central incisor and frequently has a distal and/or lingual curvature or dilaceration. The typical length measurements, given in Table 4-1, are slightly shorter than for the adjacent central incisor.

The general shape of the pulp canal, both in mesiodistal and in labiolingual section, is the same as shown by

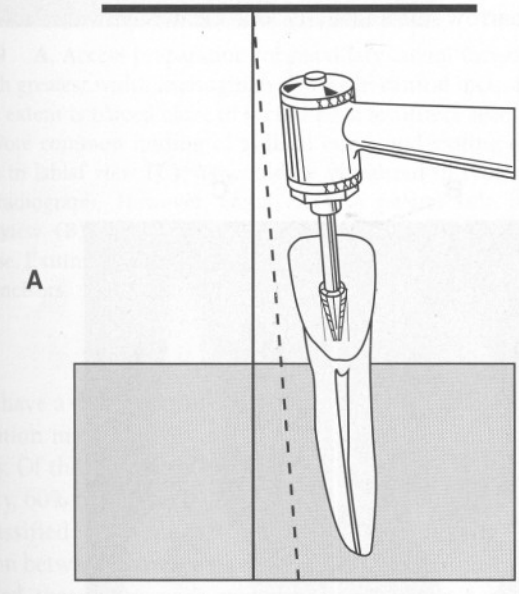




FIGURE 4-6 **A,** All burs used in access cavity preparation must be angled along the long axis of tooth being entered. As long as bur remains in center of tooth parallel to long axis, the pulp, even if diminished by dentinal sclerosis, will be reached. Note that line parallel to long axis *(dotted line)* of this mandibular anterior tooth is not perpendicular to occlusal plane *(heavy line)*. This is true on most teeth; therefore, to determine true root angulation, the dentist must obtain radiographs and perform the clinical examination before beginning the access. **B,** Failure to direct bur along the long axis of tooth has led to a perforation of distal portion of first bicuspid into periodontal ligament space. Endodontic procedures to follow will be impeded by probable ingress of microorganisms and debris unless the perforation is sealed. Even then, restoration after treatment will be much more complicated than it would have been with a proper entry.