UNIT 20 ACCESS OPENING PROCEDURES FOR ALL TEETH AND ERRORS

Structure

20.0 OBJECTIVES

After reading this unit, you should be able to:

- identify the differences in chamber and access shape for each tooth type;
- discuss the protocol to be followed while preparing the access cavity on each tooth;
- describe and draw the outline form from the occlusal view and proximal view of an endodontic cavity access on different tooth groups;
- identify common procedural errors on specific teeth that potentially could occur during the access preparation; and
- determine the techniques to minimise possible procedural errors during access cavity preparation.

20.1 INTRODUCTION

You have read in the previous unit that a carefully prepared access cavity is a keystone to successful root canal therapy. Conventional radiographs provide only a two-dimensional image of pulp anatomy. It is the third dimension that you must mentally visualise, as a supplement to two-dimensional thinking, if you have to accurately clean, shape, obturate, and fill the total pulp space. The anatomy of the canals dictates modifications of the cavity preparation. If, for example, a fourth canal is found or suspected in a molar tooth, the preparation outline will have to be expanded to allow for easy access into the accessory canal. Endodontic preparations deal with both coronal and radicular access, each of which is achieved separately but ultimately flow together into a single preparation. Before we start the access cavity preparations for individual teeth, it is important for you to be familiar with the configurations of the root canals.

As you read further in this unit, you will learn the coronal endodontic preparation for various teeth and also the common errors that are likely to occur while preparing the access cavity.

Once again it is emphasised that before starting the endodontic cavity preparation for a particular tooth, you should:

1) Refresh the knowledge of the morphology and anatomy of the tooth you are going to treat.

2) Have a good look at the tooth in the oral cavity – its shape, size, tilt and morphology need careful consideration.

3) Spend sufficient time studying the radiograph.

20.2 ENDODONTIC PREPARATION FOR MAXILLARY TEETH

The endodontic preparation for the maxillary tooth depends on its location. Before we embark on the endodontic preparation you must be familiar about the canal configurations. Despite many combinations of canals that are present in the roots of all permanent teeth, it is possible to categorise the canal systems in any root into four different types:

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 one canal

Type III- Two separate canals leaving the chamber and exiting the root in separate apical foramina

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

a) ***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. A *labio-lingual 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 exists short of the apex, to the labial direction.

The mesio-distal section reveals that the pulp cavity is wider towards the incisal area and then tapers to the apex.

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 this reason, the *outline form of the access cavity for maxillary central incisors is round but slightly triangular* to give direct access to the entire canal.

The access cavity preparation is begun by using a round-point tapered fissure bur in the exact center of the lingual surface (*entrance is always gained through the lingual surface*). The bur could be directed parallel to the long axis of the crown or at right angle to the tooth. If the access is begun at a right angle

to the long axis, there might be a possibility of penetration too far labially, or for completely missing the pulp canal on a tooth with considerable dentinal sclerosis.

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. The resulting cavity should be smooth and continuous.

The maxillary central and lateral incisor and the canine roots, and therefore, their canals 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. Failure to provide for this situation may lead to penetration of the mesial portion of the root.

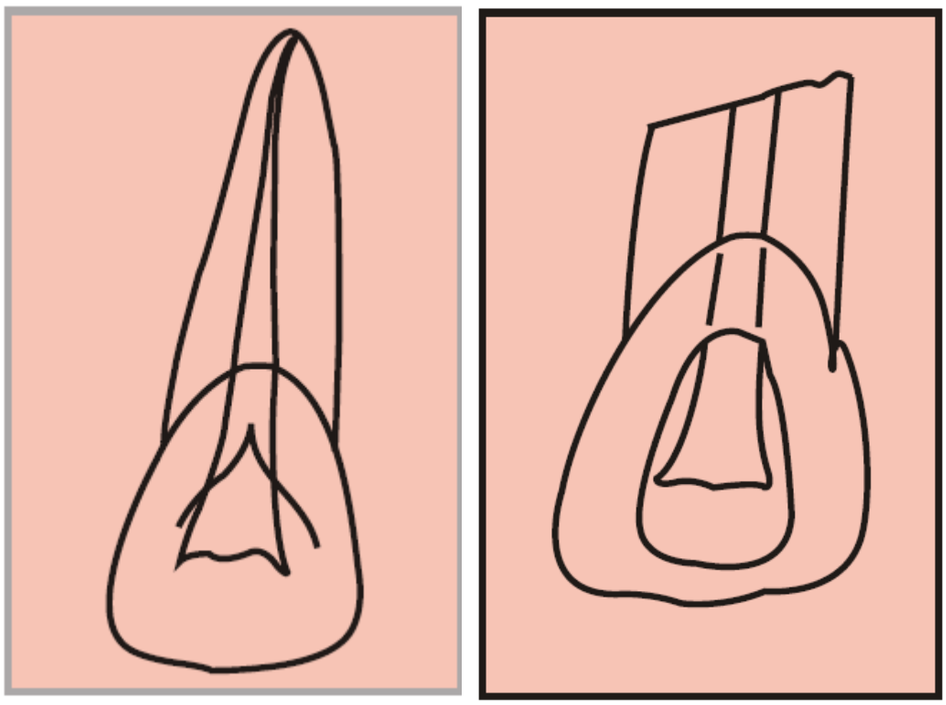

Fig. 20.1(a&b): Lingual view of maxillary central incisor

b) ***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 a lingual curvature or dilaceration. Figure 20.2(a)

The general shape of the pulp canal, both in mesio-distal and labio-lingual section, is the same as in the central incisor. In the cross section of the root through the cervical area, however, the canal is slightly ovoid and therefore, the access preparation outline form is also *ovoid, funnel shaped only slightly skewed toward mesial* to present better access to apical-distal. Figure 20.2(b).

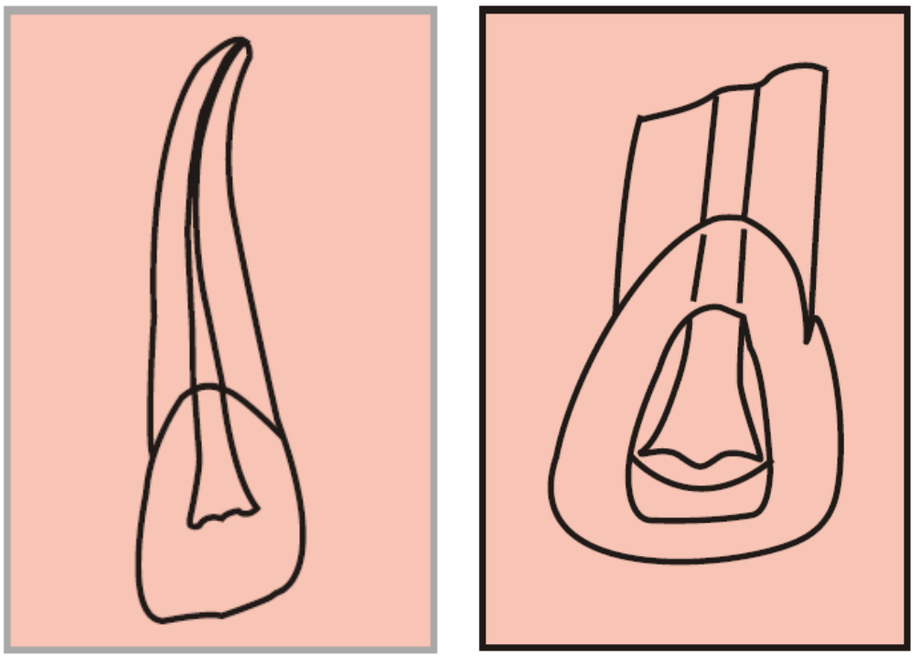

Fig. 20.2(a&b): Lingual view of maxillary lateral incisor

Check Your Progress 1

1) Describe the different types of canal combinations that may be present in the roots.

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2) Explain briefly the morphology of the root canal of the maxillary central incisor and its access preparation.

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c) ***Maxillary Canine***

The maxillary canine always has one root and Type I canal configuration. A labio-lingual section shows that the pulp canal comes to a point near the incisal area but is wide through the cervical and middle root until it reaches the apical third of the root, where it narrows (Figure 20.3a and b). However, you must be

familiar that frequently the canal exists short of the root tip to the labial direction. A mesio-distal section shows that the pulp canal is much narrower than the labio-lingual section, with a relatively regular shape all the way to the apex. In cross section through the cervical area, the canal has an oval outline.

An extensive, ovoid, funnel-shaped preparation is necessary to adequately debride the chamber of the pulpal remnants.

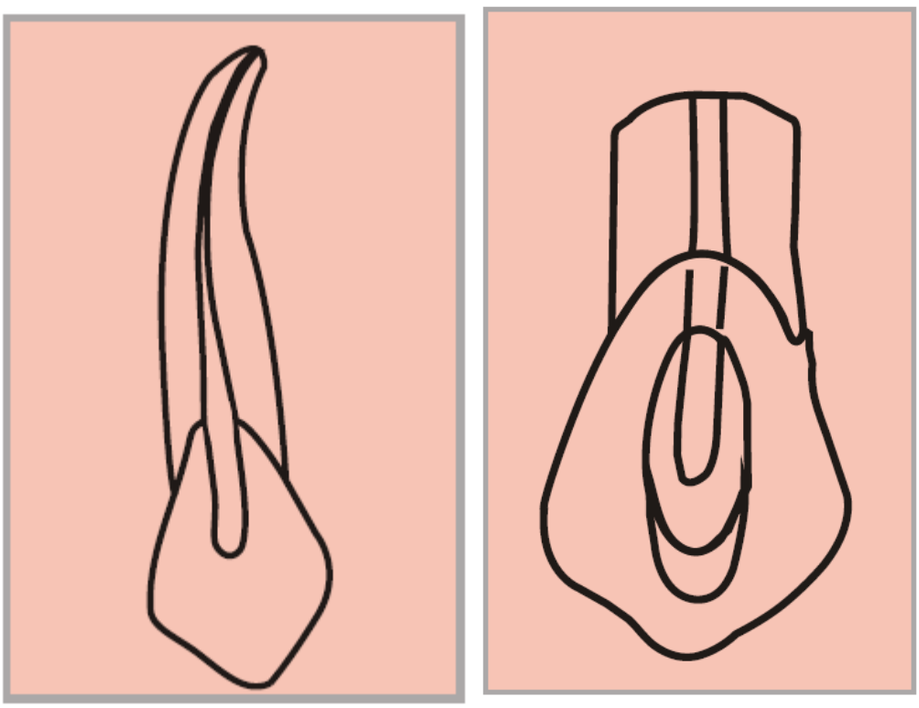

Fig. 20.3(a&b): Lingual view of maxillary canine

d) ***Maxillary First Bicuspid***

The maxillary 1st bicuspids have a number of variations in root and canal configurations. Approximately 60 per cent have 2 roots, one buccal and one palatal, each with a single canal. The 2 roots may be completely separate or merely twin projections rising from the middle third of the root to the apex, with the latter slightly more common. Approximately 38 per cent of maxillary 1st bicuspids have only one root, usually with 2 separate canals (Type III). Type II canal configuration is present less frequently. Type I is very rare. A pre-operative angled view is very helpful in determining the type of root and canal configuration present. A rare combination of roots that occur in less than 2 per cent of maxillary first bicuspids and even less frequently in second bicuspids is the tri-rooted tooth, each root with one canal. Two buccal roots and one palatal root are present in these cases.

A cross-section at the cervical line shows a ribbon-shaped canal or one shaped like a figure of eight, with the widest dimension bucco-lingually.

Therefore, the access cavity preparation is *thin oval, with the greatest width in the bucco-lingual direction.* This is exactly the opposite of the occlusal cavity preparation in bicuspids.

For all bicuspids, the initial access preparation is begun by using a tapered fissure bur in the middle of the central groove. Initial preparation is made parallel to the long axis of the tooth. Buccal and lingual movement of the bur develops the oval shape needed for most bicuspids. Once the roof of the pulp chamber is penetrated, a safe tipped fissure bur is used to uncover the orifices to give direct access to the apices. The buccal canal lies beneath the buccal cusp, whereas the palatal canal lies beneath the palatal cusp.

In case of teeth with sclerotic canals, it is usually best to locate the canal that is farthest from the deep portion of decay or existing restoration and thus is least calcified. Careful examination of the floor of the chamber, aided by fiber-optic illumination, will show the ribbon shaped outline of the pre-sclerotic pulp canal. Further exploration at the end opposite the already discovered canal will soon reveal the missing canal.

e) ***Maxillary Second Bicuspid***

The most common root configuration in maxillary second bicuspids is a single root, occurring approximately 85 per cent of the time. You must remember that Type I canal configuration is most common, but Type II, III or IV may be present, with decreasing frequency. In approximately 15 per cent, two separate roots are present, each with a single canal. An extremely rare variant has three separate roots. There is a variation in the cervical cross section of maxillary second bicuspids, depending on the canal configuration. If only one canal is present, the canal shape is slightly oval. If two canals are present, the canal shape resembles a ribbon or figure eight, as in the first bicuspid. The access preparation is exactly the same as that of maxillary first bicuspids. When only one canal is present, it is usually found easily in the **centre** of the access preparation. When only one canal is found but it is not in the **centre** of the tooth, it is probable that another canal is present and should be searched for on the opposite side.

f) ***Maxillary First Molar***

The maxillary 1st molar always has 3 separate roots, 2 buccal and 1 palatal. The disto-buccal and palatal roots always have one canal each, but the mesio-buccal may have a configuration of Type I, II or III.

A mesio-distal section through the buccal roots shows that the buccal canals are thin and well centered in their respective roots but with both orifices on the mesial three-fifths of the crown. The bucco-lingual section shows the palatal canal to be much wider than either of the buccal canals, with a buccal curve occurring near the apex in most teeth.

The orifice of the palatal root is more prominent than either buccal orifice and is located beneath the mesio-palatal cusp. The orifice of the mesio-buccal canal is located beneath the mesio-buccal cusp, but the orifice of the disto-buccal canal has no direct relation to its cusp. The disto-buccal orifice is usually located by means of its relation to the mesio-buccal orifice. The disto-buccal orifice is found approximately 2-3 mm to the distal and slightly to the palatal aspect of the mesio-buccal orifice.

In a tooth considerable dentinal sclerosis, the distance between the 2 buccal orifices will be greater. Since the buccal roots diverge as they leave the crown,

the canals form a 'V' shape and approach each other near the floor of the chamber. In dentinal sclerosis, as the reparative dentin fills the chamber and the canal diameter reduces, the orifices are found farther apart. You must keep this in mind when preparing access cavity for a tooth with heavy dentinal sclerosis.

A cross section through the cervical area shows that the pulp chamber floor has the shape of a quadrilateral, with four unequal sides. For maxillary molars the access preparation is *quadrilateral with rounded corners*. The shortest side is the palatal, parallel to the central groove. The next shorter side is the buccal and has a slope toward the disto-palatal aspect because the position of the disto-buccal orifice is farther towards the palatal than the mesio-buccal orifice. The longest side is the mesial, with the opposite side towards the distal slightly shorter. It is because of the quadrilateral shape that the mesial side does not make a sharp angle towards the palatal, and more room is available to locate the frequently found second mesio-buccal canal. Since all the orifices of this tooth lie on the mesial three-fifths of the crown, there is no need to violate the oblique ridge in preparing the access cavity.

The access cavity preparation is begun using a tapered fissure bur to penetrate the enamel in the centre of the central groove, and the access is increased in depth towards the mesio-palatal cusp. Since the palatal canal is the largest and easiest to find, it is best to locate that canal first. Once the roof of the chamber has been penetrated, a safe tipped bur is used to complete the palatal extension of the access near the mesio-palatal cusp. You can use the endodontic explorer to locate the orifice of the palatal canal. Its position will aid in the uncovering of the smaller and more difficult to locate buccal canals. The safe tipped bur is kept in contact with the floor of the pulp chamber and moved buccally to uncover the entire chamber. Once the mesio-buccal orifice is located beneath its cusp, the disto-buccal canal will be uncovered by moving the bur distally and slightly towards the palatal surface. The second mesio-buccal canal either occurs as a separate canal or merges with the main canal in approximately 50 per cent of all maxillary first molars. To uncover this fourth canal the bur is moved from the mesio-buccal orifice towards the palatal canal at a distance of 2-3 mm.

g) ***Maxillary Second Molar***

The maxillary second molar usually has similar canal configuration combinations as the first molar has: two buccal roots and one palatal root. The disto-buccal and palatal roots each have one canal, but the mesio-buccal may have two canals, with either the canals merging short of the apex (Type II) or remaining separate and distinct (Type III). The access cavity is prepared in the same manner and shape as for the first molar, except that the buccal side of the quadrilateral is not as long, since the buccal canals are usually found closer together. In second molars with sclerotic canals or those that have crowns compressed mesio-distally, the disto-buccal orifice may be located towards the centre of the access than near the mesio-buccal orifice.

A differing type of root configuration may also be present in the maxillary second molar that contains two roots, one buccal and one palatal. In still another modification these two roots merge near the apex.

Check Your Progress 2

Discuss the access opening for maxillary first molar.

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20.3 ENDODONTIC PREPARATION FOR MANDIBULAR TEETH

Before starting the endodontic preparation for mandibular teeth we have to know about tooth anatomy and its relation to the preparation of access opening. Anatomy of each tooth and their preparation are given below:

a) ***Mandibular Central and Lateral Incisor***

Central and lateral incisors are so similar in shape, configuration, and dimension that one description will hold true for both.

The mandibular incisors have only one root, which is narrow mesio-distally but relatively wide labio-lingually, and may have a distal and/or lingual curvature. The canal configuration may be of Type I, II, or III, in that order of frequency.

The labio-lingual section reveals the great width of the pulp canal which allows room for two separate canals or one wide canal with an island of dentin in the middle. A mesio-distal section shows that the pulp canal is quite narrow and is particularly constricted in the root portion of the tooth, with both the root and the canal taking a gradual distal curve. Because of this narrow mesio-distal dimension, the access preparation must be extremely precise to avoid root perforation.

A cross section in the cervical area demonstrates that the canal is a long, thin oval, very constricted mesiodistally. Because of the implication of canal configuration, the access preparation suggested is *oval but is wide labio-lingually* to allow for proper instrumentation.

b) ***Mandibular Cuspid***

Mandibular cuspids usually have only one root but in rare cases may have two separate roots. Teeth with one root may have Type I, II or III configuration. These teeth are usually the longest of the mandibular teeth but have greater length variation than do maxillary cuspids. The root canal is thin mesio-distally but wide labio-lingually. The cervical cross section is oval and so is the endodontic access cavity outline. This tooth usually has a slightly labial axial inclination of the crown. Therefore, the access is directed towards the lingual surface. However, always remember that if in case two canals are present, an access preparation that is wider bucco-lingually should be used.

c) ***Mandibular First Bicuspid***

The mandibular first premolar may cause great problems during treatment because of the relatively frequent existence of a bifurcated canal dividing in the middle or apical third (Type IV) into a buccal and a lingual branch. These teeth usually have one root and one canal, but Type II or IV configurations may be present. Rarely, a condition of two separate roots, each with one canal is present.

In cervical cross section, the canal is slightly oval and thus the access cavity has the same shape. When divided canals are present, the entry must be widened bucco-lingually. In case of Type IV canals, it is often difficult to locate the lingual canal. The buccal canal must be approached from the lingual direction and, conversely the lingual canal from the buccal.

d) ***Mandibular Second Bicuspid***

The mandibular second bicuspid usually has one root and one well centered canal. Rarely are Type II, III, or IV canal configurations present. The access preparation is generally round but may be slightly oval. You must keep in mind that when two canals are present, the entry is the same as for the bicanaled mandibular first bicuspid.

e) ***Mandibular First Molar***

The mandibular first molar generally has two separate and distinct roots, one mesial and the other distal. The mesial root always has two distinct canals leaving the floor of the pulp chamber, which exit as separate apical foramina in approximately 85 per cent of the cases (Type III canal configuration) but merge to form one apical foramen (Type II) in the remaining cases. A mesio-distal section through the tooth reveals that the orifices of both the mesial and the distal canals lie in the mesial two-thirds of the crown and the canals are well centered in their roots. A bucco-lingual section shows that the pulp chamber is in the centre of the crown and that the distal canal is wide and ribbon shaped, whereas the mesial canals are thin. The cervical cross section shows that the chamber floor is *trapezoidal*. This means that the access cavity for this tooth is also *trapezoidal with rounded corners*. The shortest side is to the distal aspect, and the mesial side is slightly longer. The buccal and lingual sides are of approximately the same length and taper towards each other distally. The mesio-lingual canal lies beneath the mesio-lingual cusp. The mesio-buccal canal is the most difficult to locate, but it is usually found on a straight line to the buccal from the mesio-lingual orifice and is deep beneath the mesio-buccal cusp.

A tapered fissure bur is used in the central pit and the preparation is increased in depth by moving the bur mesially and distally from the central pit to the mesial pit. Once the roof of the chamber is penetrated, the safe-tipped bur is used to remove the remaining overhanging tooth structure. *The distal canal is the largest and easiest to find.* Therefore, the orifice of the distal canal is located first with the endodontic explorer. The safe-tipped bur is placed in this area and moved mesially and slightly to the lingual side to uncover the mesio-lingual canal. After the latter is located, the bur is moved buccally to expose the mesio-buccal orifice. The entire preparation is confined to the mesial two-thirds of the crown.

f) ***Mandibular Second Molar***

Most common configuration of the mandibular second molar tooth is one distal canal and two mesial canals. In general the access cavity preparation is the same for the adjacent mandibular first molar. In certain cases, one mesial canal may be present. This bicanaled variation has a slightly different access preparation, with the trapezoid narrowed to the mesial to be more rectangular. When two mesial canals are present, a Type II configuration is more common than a Type III.

The mandibular second molar may have only a single root with several variants: one single, large canal; two canals that merge or remain separate; or the so-called C-shaped tooth, first described by Cooke and Cox. The tooth looks like a routine second molar when viewed on the pre-operative radiographs. When the access cavity preparation is made, from the occlusal it appears that the orifices configuration of the canals are not individually distinct but there is a C-shaped configuration on the floor of the chamber. If one file is placed in the mesial canal and one in the distal, the radiograph may reveal that both files are in the same canal. The C-shaped configuration refers to a continuous slit between all the canals so that a horizontal section through the root yields a space in the shape of the letter C.

A common condition found in mandibular second molars is the presence of two roots. In the mesial root, Type I, II, or III configurations may be present. In the distal root a Type I canal is dominant, but Types II and III systems also are possible but rare.

Check Your Progress 3

1) Discuss the access opening for mandibular first molar.

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2) What do you understand by C-shaped canals?

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20.4 ERRORS IN ACCESS CAVITY PREPARATION

Unfortunately errors can occur during the preparation of endodontic opening. Most are a result of failure to follow the access guidelines and others are due to lack of understanding of the internal and external tooth morphology. Major problems or errors in endodontic access preparation arise due to:

1) Failure to identify and excavate all caries and to remove unsupported, weak tooth structure or faulty restorations.

2) Failure to establish proper access to the pulp chamber space and root canal system.

3) Failure to identify the angle of the crown to the root and the angle of the tooth in the dental arch.

4) Failure to recognise potential problems in access openings through crowned teeth or teeth with excessively large restorations.

Many errors occur during access preparation due to under-preparation i.e., the desire to limit the removal of tooth structure. Believing that conservation of enamel and dentin will aid in the stability of the tooth during treatment and better retain the future restoration, one tends to prepare an access of minimal size. This would result in restriction of direct access to the apex, causing incomplete removal of debris, insufficient preparation of dentin walls, failure to discover additional canals, and inability to produce maximal condensation of the canal filling.

Other errors in access preparation include gouging, perforation, ledge formation, instrument breakage and these errors occur due to failure to adhere to the principles of access opening.

a) PERFORATION at the labiocervical is caused by **failure to complete convenience extension** toward the incisal, prior to the entrance of the shaft of the bur Figure 20.4.

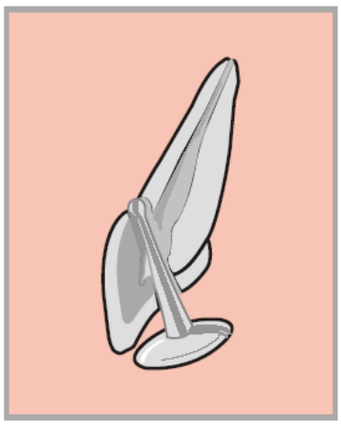

Fig. 20.4: Failure to complete convenience extension cause perforation

b) LEDGE formation at the apical-labial curve is caused by **failure to complete the convenience extension.** The shaft of the instrument rides on the cavity margin and “shoulder”. Figure 20.5

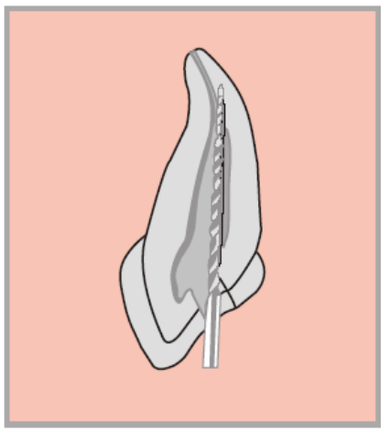

Fig. 20.5: Failure to prepare access cavity cause ledge formation

c) BIFURCATION of a canal is completely missed, caused by failure to adequately explore the canal with a curved instrument Figure 20.6.

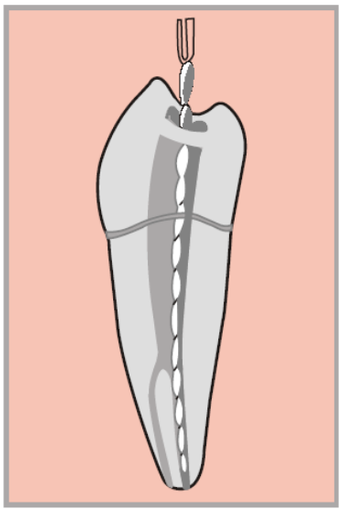

Fig. 20.6: Failure to prepare access cavity due to bifurcation of canal

d) APICAL PERFORATION of an invitingly straight conical canal. Failure to establish the exact length of the tooth leads to trephination of the foramen Figure 20.7.

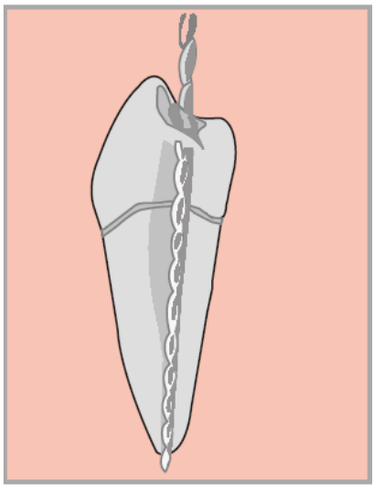

Fig. 20.7: Apical perforation of straight conical canal

e) INCOMPLETE preparation and possible instrument breakage caused by total loss of instrument control. Use only occlusal access, never buccal or proximal access Figure 20.8.

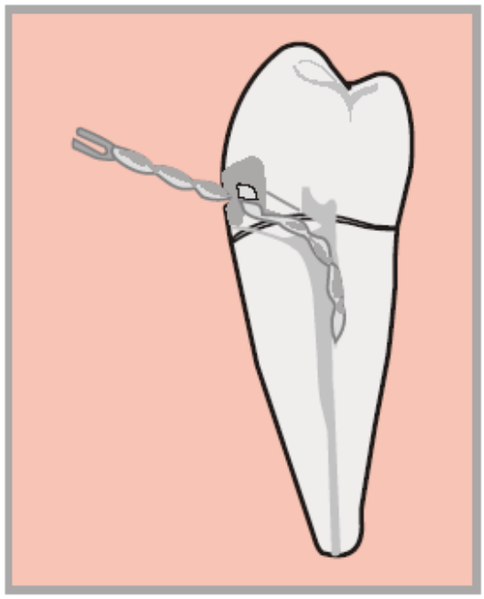

Fig. 20.8: Instrument brekage due to loss of instrument control

f) BROKEN INSTRUMENT twisted off in a “cross-over” canal. This frequent occurrence may be avoided by extending the internal preparation to straighten the canals **(dotted line)** Figure 20.9.

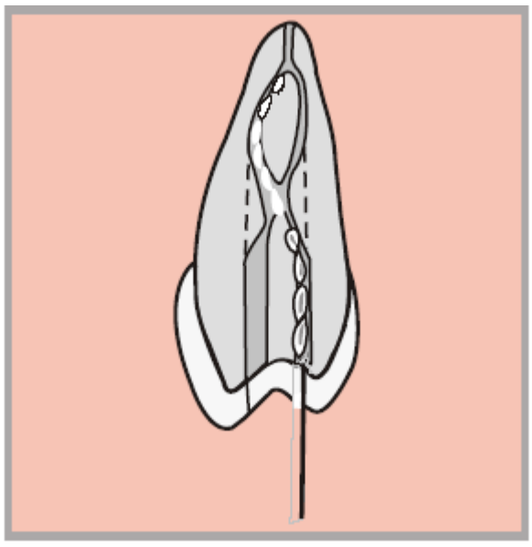

Fig. 20.9: Straighten the canal when instrument twisted off

g.) PERFORATION into furcation caused by using a longer bur and failing to realise that the narrow pulp chamber had been passed. Measure the bur against the radiograph and the depth to the pulpal floor marked on the shaft with Dycal Figure 20.10.

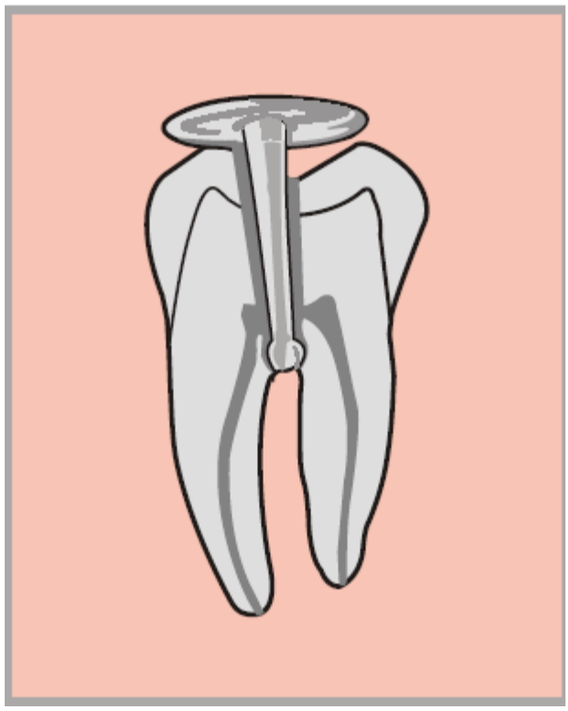

Fig. 20.10: Perforation into furcation of molar

It is therefore, important to follow the principles of access opening and to understand the internal and external tooth morphology while preparing access for an endodontic treatment.

Check Your Progress 4

What are the common errors in access cavity preparation?

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20.5 LET US SUM UP

It is known fact that the canal preparation is the most important segment of endodontic therapy. Canal preparation is divided into two phases: the coronal portion and the intraradicular 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 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.

As in restorative dentistry, the final restoration is rarely better than the initial cavity preparation. A proper access is the key to success.

A summary of the tooth length, roots canals and access cavity of the maxillary and mandibular teeth are given in the table in appendix I.

20.6 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

1) The different types of canal configurations are:

   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 one canal,

   Type III- Two separate canals leaving the chamber and exiting the root in separate apical foramina, and

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

2) 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 apical foramen frequently exists short of the apex, to the labial direction.

   The mesio-distal section reveals that the pulp cavity is wider towards the incisal area and then tapers to the apex.

   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. Therefore, the outline form of the access cavity for maxillary central incisors is round but slightly triangular to give direct access to the entire canal.

   The access cavity preparation is begun by using a round-point tapered fissure bur in the exact centre of the lingual surface. The bur could be directed parallel to the long axis of the crown or at right angle to the tooth depending on the expertise of the clinician. 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. The resulting cavity should be smooth and continuous.

Check Your Progress 2

1) For maxillary molars the access preparation is quadrilateral with rounded corners. The shortest side is the palatal, parallel to the central groove. The

next shorter side is the buccal and has a slope toward the disto-palatal aspect because the position of the disto-buccal orifice is farther towards the palatal than the mesio-buccal orifice. The longest side is the mesial, with the opposite side towards the distal slightly shorter.

The access cavity preparation is begun using a tapered fissure bur to penetrate the enamel in the centre of the central groove, and the access is increased in depth towards the mesio-palatal cusp. Since the palatal canal is the largest and easiest to find, it is best to locate that canal first. The endodontic explorer is used to locate the orifice of the palatal canal. The safe tipped bur is kept in contact with the floor of the pulp chamber and moved buccally to uncover the entire chamber. Once the mesio-buccal orifice is located beneath its cusp, the disto-buccal canal will be uncovered by moving the bur distally and slightly towards the palatal surface. The second mesio-buccal canal either occurs as a separate canal or merges with the main canal in approximately 50 per cent of all maxillary first molars. To uncover this fourth canal the bur is moved from the mesio-buccal orifice towards the palatal canal at a distance of 2-3 mm.

Check Your Progress 3

1) The access cavity for mandibular first molar tooth is trapezoidal with rounded corners. The shortest side is to the distal aspect, and the mesial side is slightly longer. The buccal and lingual sides are of approximately the same length and taper towards each other distally. The mesio-lingual canal lies beneath the mesio-lingual cusp. The mesio-buccal canal is the most difficult to locate, but it is usually found on a straight line to the buccal from the mesio-lingual orifice and is deep beneath the mesio-buccal cusp.

   A tapered fissure bur is used in the central pit and the preparation increased in depth by moving the bur mesially and distally from the central pit to the mesial pit. The distal canal is the largest and easiest to find. Therefore, the orifice of the distal canal is located first with the endodontic explorer. The safe-tipped bur is placed in this area and moved mesially and slightly to the lingual side to uncover the mesio-lingual canal. After the latter is located, the bur is moved buccally to expose the mesio-buccal orifice. The entire preparation is confined to the mesial two-thirds of the crown.

2) The mandibular second molar may have only a single root with several variants: one single, large canal; two canals that merge or remain separate; or the so-called C-shaped tooth. The C-shaped tooth was first described by Cooke and Cox. The tooth looks like a routine second molar when viewed on the pre-operative radiographs. When the access cavity preparation is made, from the occlusal it appears that the orifices of the canals are not individually distinct but there is a C-shaped configuration on the floor of the chamber. If one file is placed in the mesial canal and one in the distal, the radiograph may reveal configuration both files are in the same canal. The C-shaped configuration refers to a continuous slit between all the canals so that a horizontal section through the root yields a space in the shape of the letter C.

Check Your Progress 4

Most common errors in access cavity preparation arise due to failure to imply the principles of access opening and to have the three dimensional image of the tooth in mind while preparing the access. There could be: failure to identify and excavate all caries and to remove unsupported, weak tooth structure or faulty restorations; failure to establish proper access to the pulp chamber space and root canal system; failure to identify the angle of the crown to the root and the angle of the tooth in the dental arch; failure to recognise potential problems in access openings through crowned teeth or teeth with excessively large restorations.

20.7 FURTHER READINGS

Endodontics; Fifth Edition; *Ingle and Bakland.*

Endodontic Therapy; *Franklin S.Weine.*

Pathways of the Pulp; *Cohen S, Hargreaves KM*

Problem Solving in Endodontics; Gutmann JL.