DEPARTMENT OF ORAL AND MAXILLOFACIAL PATHOLOGY & ORAL MICROBIOLOGY

MANDIBULAR FIRST MOLAR

INTRODUCTION:

The mandibular first molar is the largest tooth in the mandibular arch. It has five well-developed cusps: two buccal, two lingual and a distal cusp.

It has two well-developed roots, one mesial and one distal, which are very broad Bucco-lingually. These roots are widely separated at the apices.

The dimension of the crown mesiodistally is greater by about 1 mm than the dimension buccolingually.

Although the crown is relatively short cervico-occlusally, it has mesiodistal and buccolingual measurements that provide a broad occlusal form

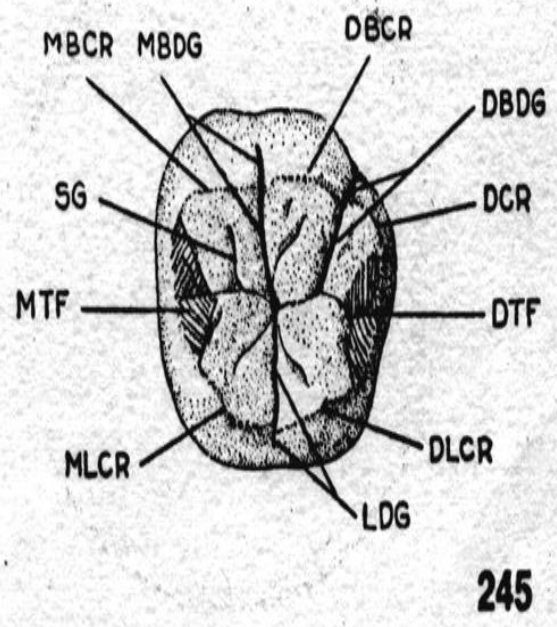


Figure 12–1. Mandibular right first molar, occlusal aspect. *DBCR*, Distobuccal cusp ridge; *DBDG*, distobuccal developmental groove; *DCR*, distal cusp ridge; *DTF*, distal triangular fossa (shaded area); *DLCR*, distolingual cusp ridge; *LDG*, lingual developmental groove; *MLCR*, mesiolingual cusp ridge; *MTF*, mesial triangular fossa (shaded area); *SG*, a supplemental groove; *MBCR*, mesiobuccal cusp ridge; *MBDG*, mesiobuccal developmental groove.

The mesial root is broad and curved distally, with mesial and distal fluting that provides the anchorage of two roots.

The distal root is rounder, broad at the cervical portion, and pointed in a distal direction.

The formation of these roots and their positions in the mandible serve to brace efficiently the crown of the tooth against the lines of force that might be brought to bear against it.

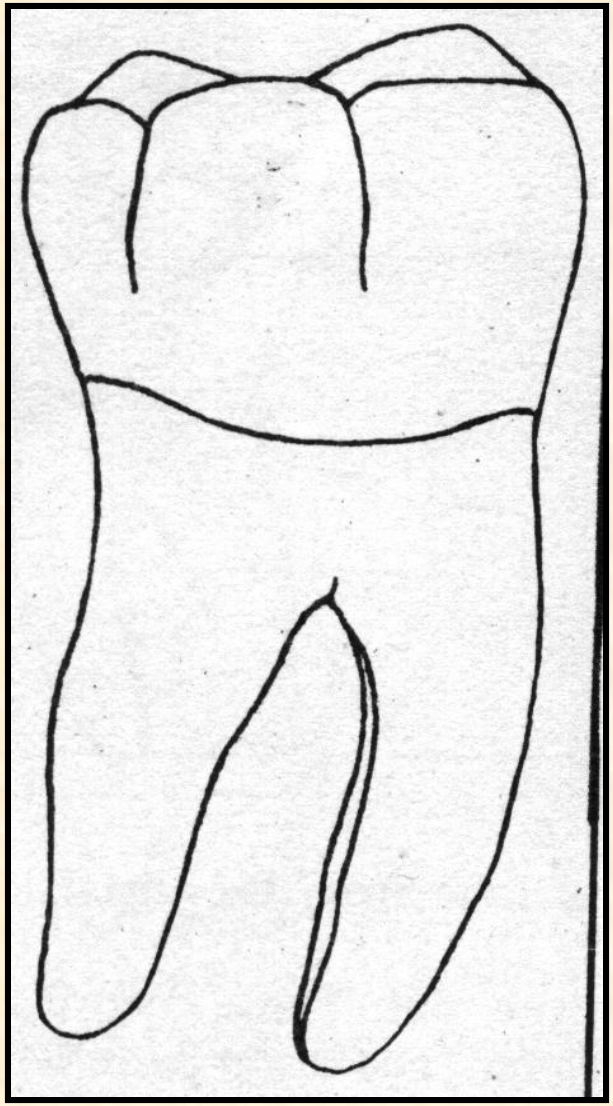
BUCCAL ASPECT:

From the buccal aspect, the crown of the mandibular first molar is roughly trapezoidal, with cervical and occlusal outlines representing the uneven sides of the trapezoid. The occlusal side is the longer.

If this tooth is posed vertically, all five of its cusps are in view.

The two buccal cusps and the buccal portion of the distal cusp are in the foreground, with the tips of the lingual cusps in the background.

The lingual cusps may be seen because they are higher than the others.



RIGHT SIDE

Two developmental grooves appear on the crown portion. These grooves are called the *Mesiobuccal developmental groove* and the *distobuccal developmental groove*.

The first names groove acts as a line of demarcation between the Mesiobuccal lobe and the distobuccal lobe. The latter groove separates the distobuccal lobe from the distal lobe.

The Mesiobuccal, distobuccal, and distal cusps are relatively flat. These cusp ridges show less curvature than those of any of the teeth described so far.

The distal cusp, which is small, is more pointed than either of the buccal cusp.

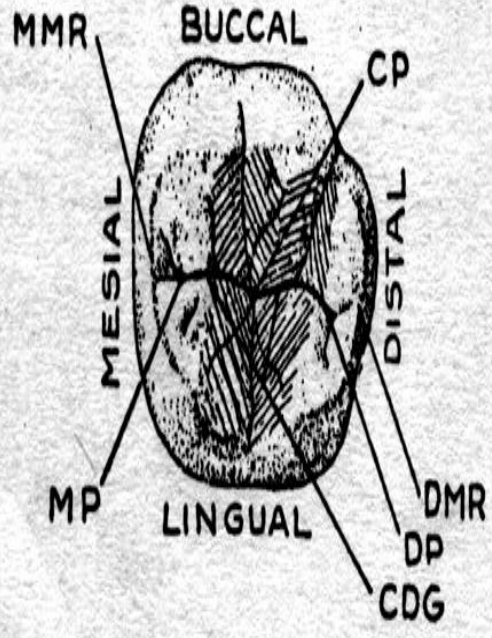


Figure 12–2. Mandibular right first molar, occlusal aspect. Shaded area—central fossa. *CP*, Central pit; *DMR*, distal marginal ridge; *DP*, distal pit; *CDG*, central developmental groove; *MP*, mesial pit; *MMR*, mesial marginal ridge.

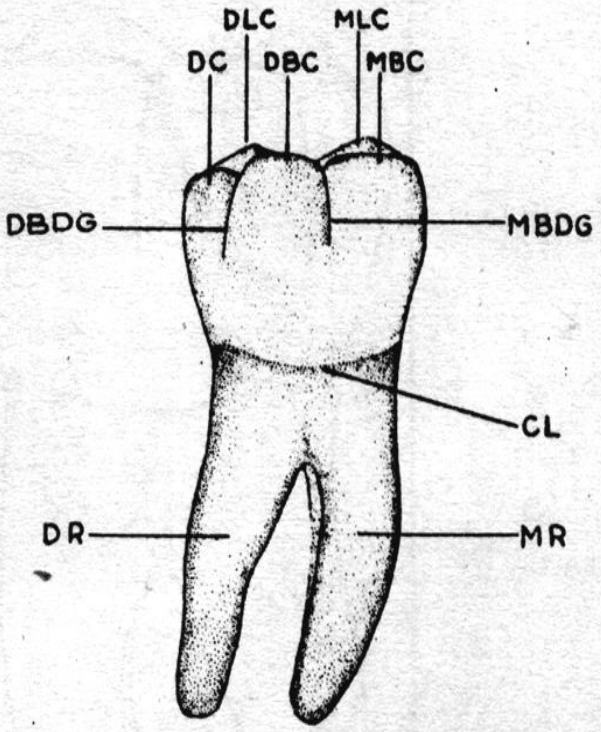


Figure 12–3. Mandibular right first molar, buccal aspect. *MBDG*, Mesiobuccal developmental groove; *CL*, cervical line; *MR*, mesial root; *DR*, distal root; *DBDG*, distobuccal developmental groove; *DC*, distal cusp; *DLC*, distolingual cusp; *DBC*, distobuccal cusp; *MLC*, mesiolingual cusp; *MBC*, mesiobuccal cusp.

Flattened buccal cusps are typical of all mandibular molars. Most first molar specimens have the buccal cusps worn considerably, showing the buccal cusp ridges almost at the same level.

Before they are worn, the buccal cusps and the distal cusp have curvatures that are characteristic of each one.

The Mesiobuccal cusp is usually the widest mesiodistally of the three cusps. This cusp has some curvature but is relatively flat.

The distobuccal cusp is almost as wide, with a cusp ridge of somewhat greater curvature

The two buccal cusps make up the major portion of the buccal surface of the crown. The distal cusp provides a very small part of the buccal surface, since the major portion of the cusp makes up the distal portion of the crown, providing the distal contact are on the center of the distal surface of the distal cusp.

The distal cusp ridge is very round occlusally, being sharper than either of the two buccal cusps.

These three cusps have the Mesiobuccal and distobuccal grooves as lines of demarcation. The Mesiobuccal groove is the shorter of the two, having its terminus centrally located cervico-occlusally.

This groove is situated a little mesial to the root bifurcation bucally. The distobuccal groove has its terminus near the distobuccal line angle at the cervical third of the crown. It travels occlusally and somewhat mesially, parallel with the axis of the distal root.

The cervical line of the mandibular first molar is commonly regular in outline, dipping apically toward the root bifurcation.

The mesial outline of the crown is somewhat concave at the cervical third up to its junction with the convex outline of the broad contact area.

The distal outline of the crown is straight above the cervical line to its junction with the convex outline of the distal contact area, which is also the outline of the distal portion of the distal cusp.

The calibration of this tooth at the cervical line is 1.5 to 2mm less mesiodistally than the mesiodistal measurement at the contact areas, which of course represents the greatest mesiodistal measurement of the crown.

The surface of the buccal portion of the crown is smoothly convex at the cusp portions with developmental grooves between the cusps.

Approximately at the level of the ends of the developmental grooves, in the middle third, a developmental depression is noticeable. It runs in a mesiodistal direction just above the cervical ridge of the buccal surface.

This cervical ridge may show a smooth depression in it which progresses cervically, joining with developmental concavity just below the cervical line, which is congruent with the root bifurcation bucally.

The roots of this tooth are, in most instances, well formed and constant in development.

When the tooth is posed so that the Mesiobuccal groove is directly in the line of vision, part of the distal surface of the root trunk may be seen and, in addition, we may se part of the distal area of the mesial root because the lingual portion of the root is turned distally.

These areas may be seen in addition to the buccal areas of the roots and root trunk.

The mesial root is curved mesially from a point shortly below the cervical line to the middle third portion. From this point it curves distally to the tapered apex, which is located directly below the Mesiobuccal cusp.

The crest of curvature of the root mesially is mesial to the crown cervix. The distal outline of the mesial root is concave from the bifurcation of the root trunk to the apex.

The distal root is less curved than the mesial root, and its axis is in a distal direction from cervix to apex.

The root may show some curvature at its apical third in wither a mesial or a distal direction. The apex is usually more pointed than that of the mesial root and is located below or distal to the distal contact area of the crown.

There is considerable variation in the comparative lengths of mesial distal roots.

Both roots are wider mesiodistally at the buccal areas than they are lingually.

Developmental depressions are present of the mesial and distal sides of both roots-a fact that lessens the mesiodistal measurement at those points. They are somewhat thicker at the lingual borders.

This arrangement provides a secure anchorage for the mandibular first molar, preventing rotation. This I-beam principle increases the anchorage of each root.

The point of bifurcation of the two roots is located approximately 3 mm below the cervical line.

There is a deep developmental depression bucally on the root trunk, which starts at the bifurcation and progresses cervically, becoming more shallow until it terminates at or immediately above the cervical line.

This depression is smooth with no developmental groove or fold.

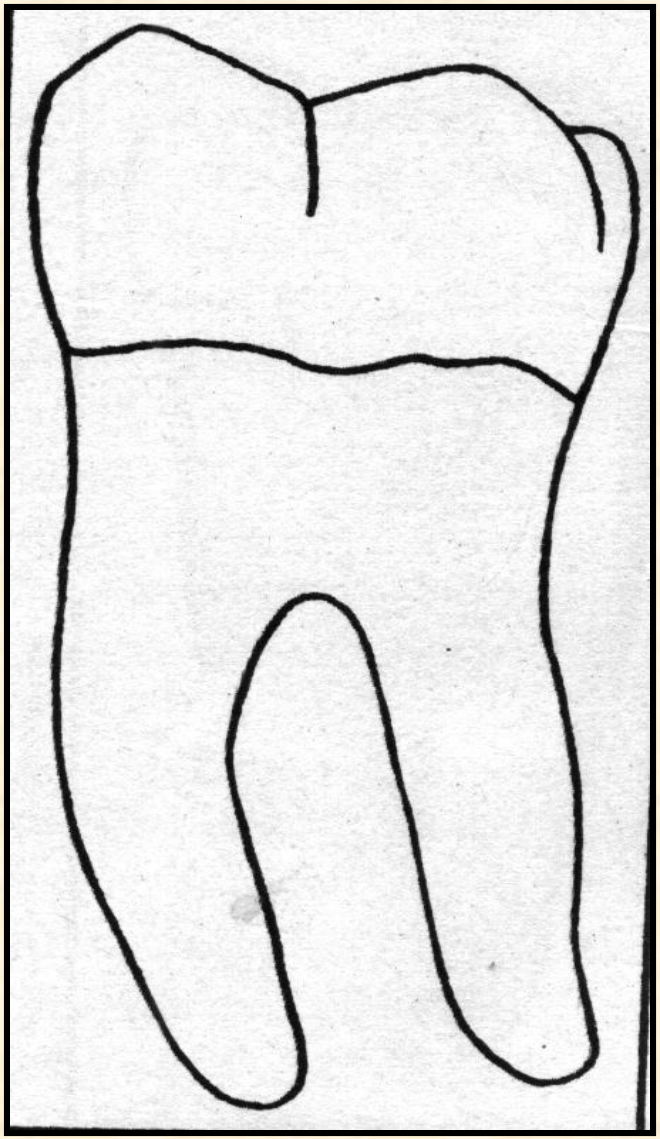
LINGUAL ASPECT:

From the lingual aspect, three cusps may be seen: two lingual cusps and the lingual portion of the distal cusp.

The two lingual cusps are pointed, and the cusp ridges are high enough to hide the two buccal cusps from view.

The mesiolingual cusp is the widest mesiodistally, with its cusp tip somewhat higher than the Distolingual cusp.

The Distolingual cusp is almost as wide mesiodistally as the mesiolingual cusp.



The mesiolingual and Distolingual cusp ridges are inclined at angles that are similar on both lingual cusps. These cusp ridges form obtuse angles at the cusp tips of approximately 100 degrees.

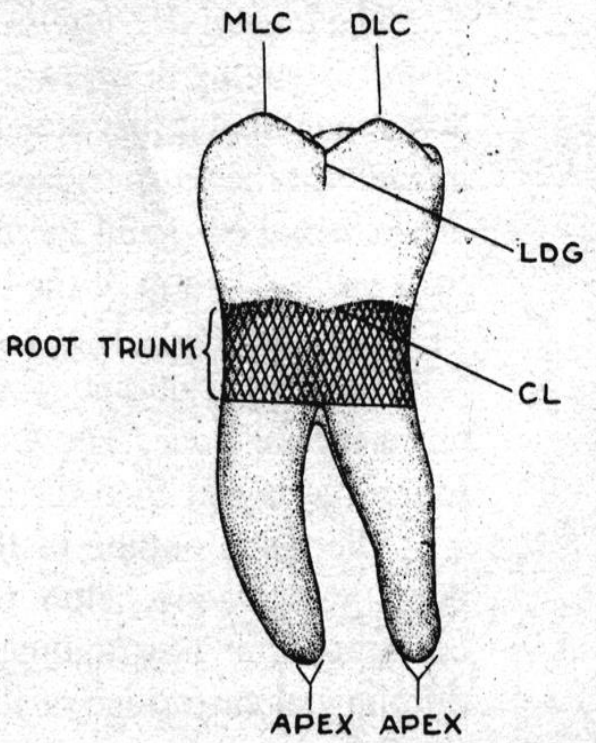


Figure 12–5. Mandibular right first molar, lingual aspect. *MLC*, Mesiolingual cusp; *DLC*, distolingual cusp; *LDG*, lingual developmental groove; *CL*, cervical line.

The *lingual developmental groove* serves as a line of demarcation between the lingual cusps, extending downward on the lingual surface of the crown for a short distance only.

Some mandibular first molars show no groove on the lingual surface but show a depression lingual to the cusp ridges.

The angle formed by the Distolingual cusp ridge of the mesiolingual cusp and the mesiolingual cusp ridge of the Distolingual cusp is more obtuse than the angulation of the cusp ridges at the tips of the lingual cusps.

The distal cusp is at a lower level than the mesiolingual cusp.

The mesial outline of the crown from this aspect is convex from the cervical line to the marginal ridge. The crest of contour mesially, which represents the contact area, is somewhat higher than the crest of contour distally.

The distal outline of the crown is straight immediately above the cervical line to a point immediately below the distal contact area; this area is represented by a convex curvature that also outlines the distal surface of the distal cusp.

The junction of the Distolingual cusp ridge of the Distolingual cusp with the distal marginal ridge is abrupt; it gives the impression of a groove at this site from the lingual aspect.

Part of the mesial and distal surfaces of the crown and root trunk may be seen from this aspect because the mesial and distal sides converge lingually.

The cervical line lingually is irregular and tends to point sharply toward the root bifurcation and immediately above it.

The surface of the crown lingually is smooth and spheroidal on each of the lingual lobes.

The surface is concave at the side of the lingual groove above the center of the crown lingually, below this point, the surface of the crown becomes almost flat as it approaches the cervical line.

The roots of the mandibular first molar appear somewhat different from the lingual aspect.

They measure about 1 mm longer lingually than bucally, but the length seems more extreme. This impression is derived from the fact that the cusp ridges and cervical line are at a higher level.

This arrangement adds a millimeter to the distance from root bifurcation to cervical line. In addition, the mesiodistal measurement of the root trunk is less toward the lingual surface than toward the buccal surface.

Consequently, this slenderness lingually, in addition to the added length, makes the roots appear longer than they are from the lingual aspect.

As was mentioned, the root bifurcation lingually starts as a point approximately 4 mm below the cervical line. This developmental depression is quite deep at this point, although it is smooth throughout and progresses cervically and becomes more shallow until it fades out entirely immediately below the cervical line.

The depression is rarely reflected in the cervical line or the enamel of the lingual surface of the crown as is found in many cases on the buccal surface of this tooth.

This bifurcation groove of the root trunk is located almost in line with the lingual developmental groove of the crown.

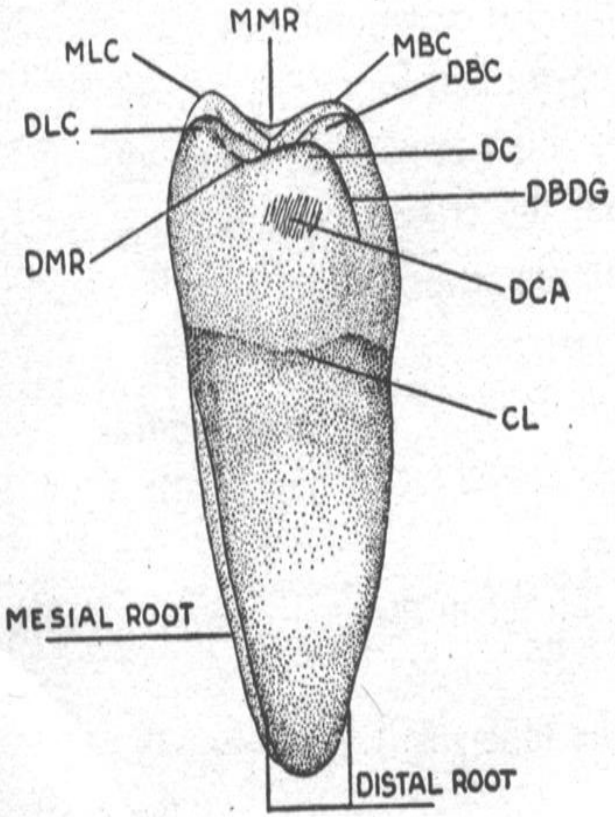


Figure 12–9. Mandibular right first molar, distal aspect. *MMR*, Mesial marginal ridge; *MBC*, mesiobuccal cusp; *DBC*, distobuccal cusp; *DC*, distal cusp; *DBDG*, distobuccal developmental groove; *DCA*, distal contact area; *CL*, cervical line; *DMR*, distal marginal ridge; *DLC*, distolingual cusp; *MLC*, mesiolingual cusp.

MESIAL ASPECT:

When the mandibular first molar is viewed from the mesial aspect, the specimen being held with its mesial surface at right angles to the line of vision, two cusps and one root only are to be seen: the Mesiobuccal and mesiolingual cusps and the mesial root.

The buccolingual measurement of the crown is greater at the mesial portion than it is at the distal portion.

The buccolingual measurement of the mesial root is also greater than the same measurement of the distal root.

Therefore, since the mesial portions of the tooth are broader and the mesial cusps are higher, the distal portions of the tooth cannot be seen from this angle.

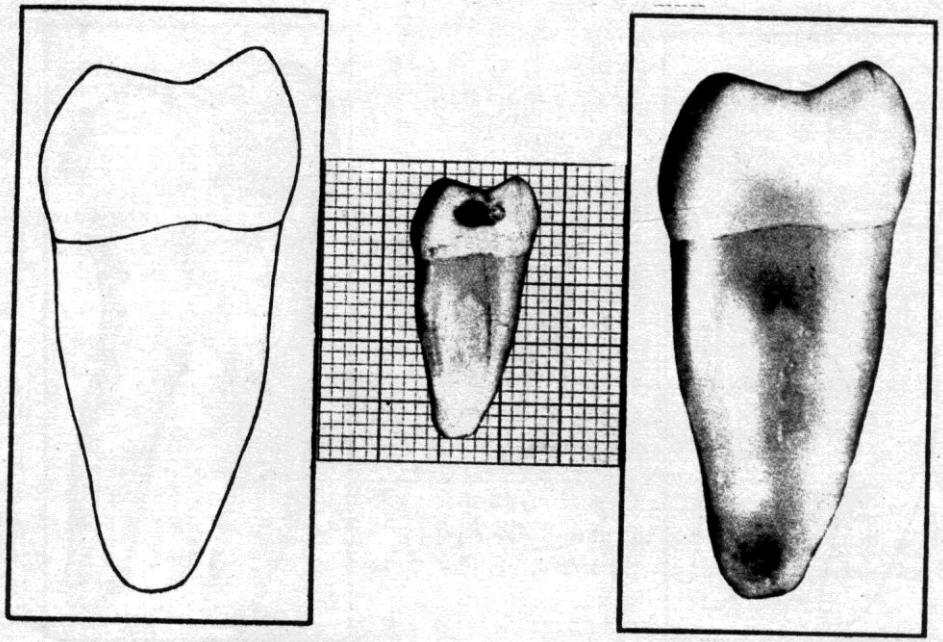


Figure 12–7. Mandibular right first molar, mesial aspect.

As mentioned before, all of the posterior mandibular teeth have crown outlines from the mesial aspect that show a characteristic relation between crown and root.

The crown from the mesial or distal aspect is roughly rhomboidal, and the entire crown has a lingual tilt in relation to the root axis.

It should be remembered that the crown of maxillary posterior teeth have the center of the occlusal surfaces between the cusps in the line with the root axes.

It interesting to note the difference between the outline form of the mandibular first molar and the mandibular second premolar from the mesial aspect.

The first molar compares as follows:

1) The crown is a fraction of a millimeter to a millimeter shorter in the first molar.

2) The root is usually that much shorter also.

3) The buccolingual measurement of crown and root of the molar is 2 mm or greater.

4) The lingual cusp is longer than the buccal (The opposite is true of the second premolar)

   Regardless of these differences, the two teeth have the same functional form except for the added reinforcement given to the molar lingually

From the mesial aspect, the buccal outline of the crown of the mandibular first molar is convex immediately above the cervical line.

Before occlusal wear has shortened the buccal cusps, this curvature is over the cervical third of the crown bucally, outlining the buccal cervical ridge.

This ridge is more prominent on some first molar than on others.

Just as on mandibular premolars, this ridge curvature does not exceed similar contours on other teeth as a rule when the mandibular first molar is posed in the position it assumes in the mandibular arch.

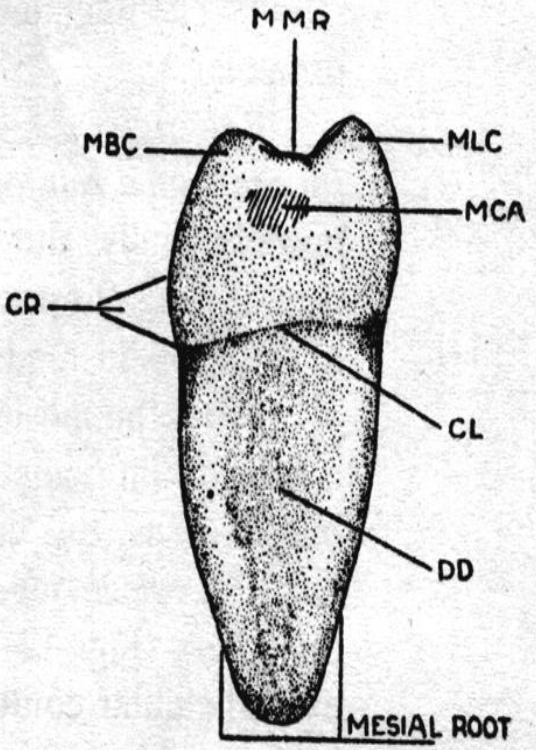


Figure 12–8. Mandibular right first molar, mesial aspect. *MMR*, Mesial marginal ridge; *MLC*, mesiolingual cusp; *MCA*, mesial contact area; *CL*, cervical line; *DD*, developmental depression; *CR*, cervical ridge; *MBC*, mesiobuccal cusp.

Above the buccal cervical ridge, the outline of the buccal contour may be slightly concave on some specimens, or the outline may just be less convex or even rather flat as it continues occlusally outlining the contour of the Mesiobuccal cusp.

The Mesiobuccal cusp is located directly above the buccal third of the mesial root.

The lingual outline of the crown is straight in a lingual direction, starting at the cervical line and joining the lingual curvature at the middle third, the lingual curvature being pronounced between this point and the tip of the mesiolingual cusp.

The crest of the lingual contour is located at the center of the middle third of the crown. The tip of the mesiolingual cusp is in a position directly above the lingual third of the mesial root.

The mesial marginal ridge is confluent with the mesial ridges of the Mesiobuccal and mesiolingual cusps. The marginal ridge is placed about 1 mm below the level of the cusp tips.

The cervical line mesially is rather irregular and tends to curve occlusally about 1 mm toward the center of the mesial surface of the tooth.

The cervical line may assume a relatively straight line buccolingually
.
In all instances, the cervical line is at a higher lingually than bucally, usually about 1 mm higher. The difference in level may be greater. This relation depends upon the assumption that the tooth is posed vertically.

When the first molar is in its normal position in the lower jaw, leaning to the lingual, the cervical line is nearly level buccolingually.

The surface of the crown is convex and smooth over the mesial contours of the mesiolingual and Mesiobuccal lobes.

A flattened or slightly concave area exists at the cervical line immediately above the center of the mesial root.

This area is right below the contact area and joins the concavity of the central portion of the root at the cervix.

The contact area is almost centered buccolingually in the mesial surface of the crown, and it is placed below the crest of the marginal ridge about one third the distance from marginal ridge to cervical line. Before contact wear has occurred, the contact area is not so broad.

The buccal outline of the mesial root drops straight down from the cervical line bucally to a point near the junction of cervical and middle thirds of the root. There is a gentle curve lingually from this point to the apex, which is located below the Mesiobuccal cusp.

The lingual outline of the mesial root is slanted in a buccal direction, although the outline is nearly straight from the cervical line lingually to the point of junction of middle and apical thirds of the root.

From this point, the curvature is sharply buccal to the bluntly tapered apex.

On those specimens that show a short bifurcation at the mesial root end, the curvature at the apical third lingually is slight.

The mesial surface of the mesial root is convex at the buccal and lingual borders, with a broad concavity between these convexities the full length of the root from cervical line to apex.

If a specimen tooth is held in front of a strong light so that we may see distal side of the mesial root form the apical aspect, it is noted that the same contours exist on the root distally as are found mesially and the root is very thin where the concavities are superimposed.

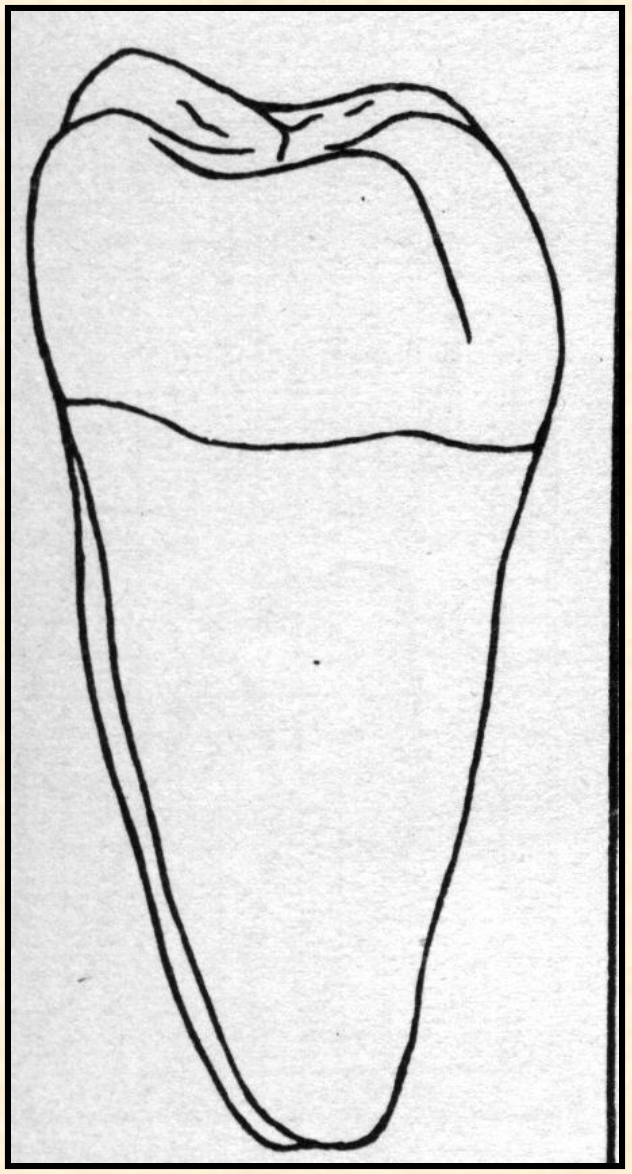
The root form appears to be two narrow roots fused together with thin hard tissue between.

The mesial surface of the distal root is smooth, with no deep developmental depressions.

DISTAL ASPECT:

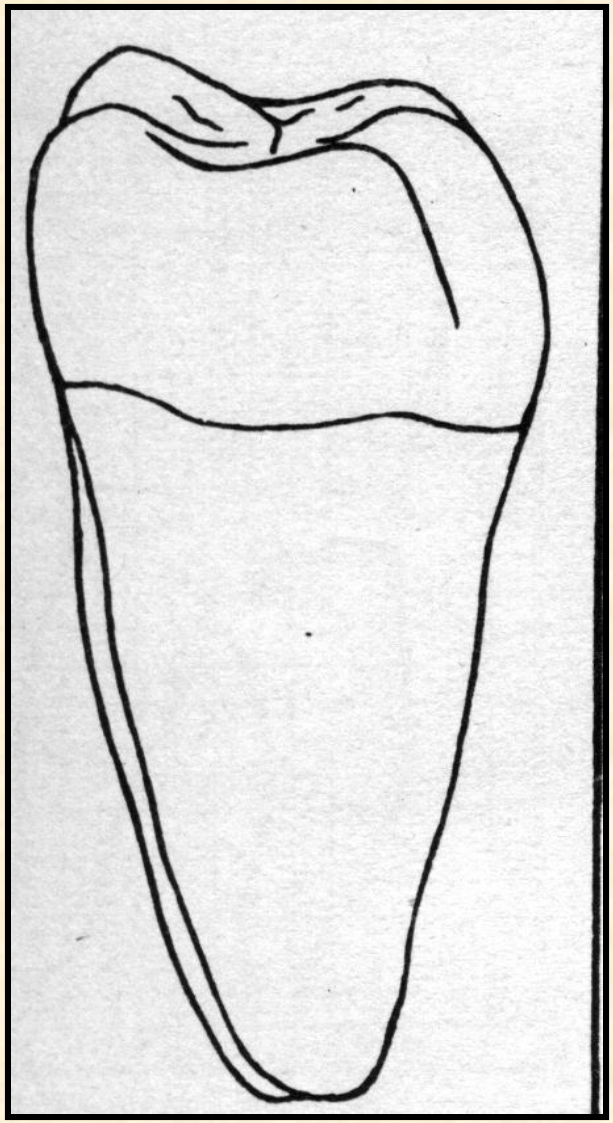
Since the gross outline of the distal aspect of crown and root of the mandibular first molar is similar to the mesial aspect, the description of outline form will not be repeated.

When considering this aspect from the standpoint of a three-dimensional figure, however, we see more of the tooth from the distal aspect because the crown is shorter distally than mesially, and the buccal and lingual surfaces of the crown converge distally.



The distal root is narrower buccolingually than the mesial root.

If a specimen of the first molar is held with the distal surface of the crow n at right angles to the line of vision, a great part of the occlusal surface may be seen and some part of each of the five cusps also comparing favorably with the mandibular second premolar



This is caused in part by the placement of the crowns on the roots with a distal inclination to the long axes.

The slight variation in crown length distally does not provide this view of the occlusal surface.

From the distal aspect the distal cusp is in the foreground on the crown portion.

The distal cusp is placed a little buccal to center buccolingually, the distal contact area appearing on its distal contour.

The distal contact area is placed just below the distal cusp ridge of the distal cusp and at a slight higher level above the cervical line than was found mesially when comparing the location of the mesial contact area.

The distal marginal ridge is short and is made up of the distal cusp ridge of the distal cusp and the Distolingual cusp ridge of the Distolingual cusp.

These cusp ridges dip sharply in a cervical direction, meeting at an obtuse angle. Often a developmental groove or depression is found crossing the marginal ridge at this point.

The point of this angle is above the lingual third of the distal root instead of being centered over the root as is true of the center of the mesial marginal ridge.

The distal contact area is centered over the distal root, which arrangement places it buccal to the center point of the distal marginal ridge.

The surface of the distal portion of the crown is convex on the distal cusp and the Distolingual cusp.

Contact wear may produce a flattened area at the point of contact on the distal surface of the distal cusp.

Just above the cervical line, the enamel surface is flat where it joins the flattened surface of the root trunk distally.

The cervical line distally usually extends straight across buccolingually.

It may be irregular, dipping root-wise just below the distal contact area.

The end of the distobuccal developmental groove is located on the distal surface and forms a concavity at the cervical portion of the distobuccal line angle of the crown.

The distal portion of the crown extends out over the root trunk distally at quite an angle. The smooth flat surface below contact area remains fairly constant to the apical third of the distal root.

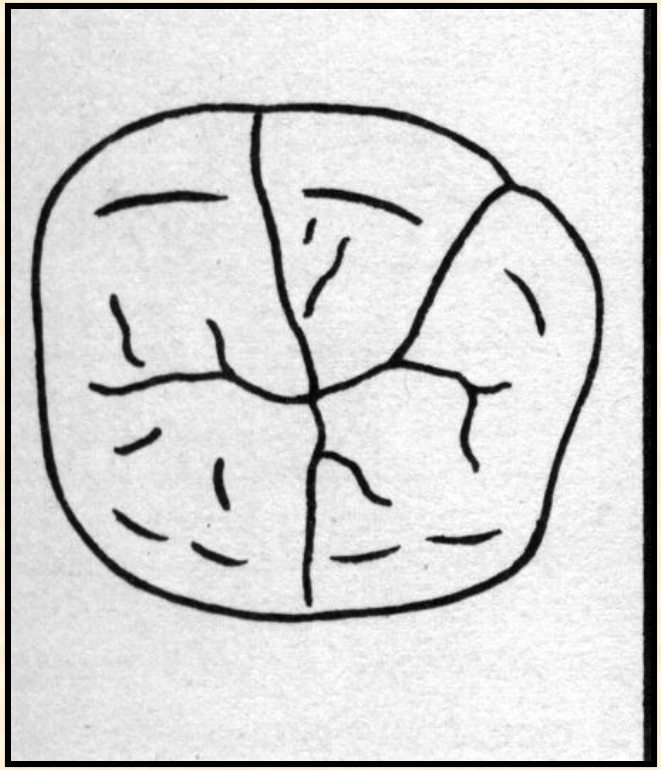
Sometimes a developmental depression is found here. The apical third portion of the root is more rounded as it tapers to a sharper apex than is found on the mesial root.

The lingual borders of the mesial root may be seen from the distal aspect.

OCCLUSAL ASPECT:

The mandibular first molar is somewhat hexagonal from the occlusal aspect. The crown measurement is 1 mm or more greater mesiodistally than buccolingually. It must be remembered that the opposite arrangement is true of the maxillary first molar.

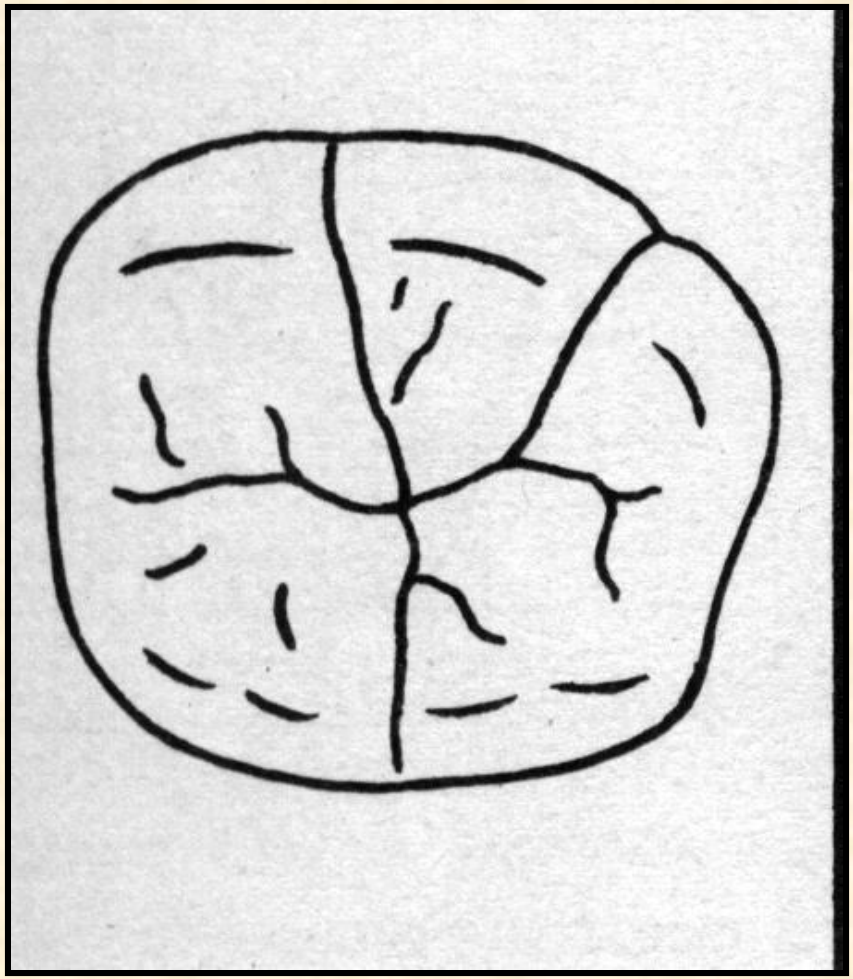
The buccolingual measurement of the crown is greater on the mesial than on the distal.



Also, a measurement of the crown at the contact areas, which includes the two buccal cusps and the distal cusp, shows greater measurement than the mesiodistal measurement of the two lingual cusps.

In other words, the crown converges lingually from the contact areas.

This convergence varies in individual specimens.



It is interesting to note degree of development of the individual cusps from the occlusal aspect.

The Mesiobuccal cusp is slightly larger than either of the two lingual cusps, which are almost equal to each other in size; the distobuccal cusp is smaller than any one of the other three mentioned, and the distal cusp is in most cases much the smallest of all.

There is more variance in the development of the distobuccal and distal lobes than in any of the others.

When the tooth is posed so that the line of vision is parallel with the long axis, a great part of the buccal surface may be seen, whereas only a small portion of the lingual surface may be seen lingual to the lingual cusp ridges.

No part of the mesial or distal surfaces is in view below the outline of the mesial and distal marginal ridges.

All mandibular molars, including the first molar, are essentially quadrilateral in form.

The mandibular first molar, in most instances, has a functioning distal cusp, although this is small in comparison with the other cusps.

Occasionally four-cusp first molars are found, and more often one discovers first molars with distobuccal and distal cusps showing fusion with little or no trace of a distobuccal developmental groove between them.

From a developmental viewpoint, all mandibular molars have four major cusps, whereas maxillary molars have only three major cusps.

The occlusal surfaces the mandibular first molar may be described as follows:

There is a major fossa and there two minor fossae.

The major fossa is the central fossa. It is roughly circular, and it is centrally placed on the occlusal surface between buccal and lingual cusp ridges.

The two minor fossae are the mesial triangular fossa, immediately distal to the mesial marginal ridge, and the distal triangular fossa, placed immediately mesial to the distal marginal ridge.

The developmental grooves on the occlusal surface are the central developmental groove, the Mesiobuccal developmental groove, the distobuccal developmental groove, and the lingual developmental groove.

Supplemental grooves, accidental short grooves and developmental pits are also found.

Most of the supplemental grooves are tributary to the developmental grooves within the bounds of cusp ridges.

The central fossa of the occlusal surface is a concave area bounded by the distal slope of the Mesiobuccal cusp, both mesial and distal slopes of the distobuccal cusp, the mesial slope of the distal cusp, the distal slope of the mesiolingual cusp, and the mesial slope of the Distolingual cusp.

All of the developmental grooves converge in the center of the central fossa at the central pit.

The mesial triangular fossa of the occlusal surface is a smaller concave area than the central fossa, and it is bounded by the mesial slope of the Mesiobuccal cusp, the mesial marginal ridge and the mesial slope of the mesiolingual cusp.

The mesial portion of the central developmental groove terminates in this fossa. Usually a buccal and a lingual supplemental groove join it at a mesial pit within the boundary of the mesial marginal ridge.

Sometimes a supplemental groove crosses the mesial marginal ridge lingual to the contact area.

The distal triangular fossa is in most instances less distinct than the mesial fossa. It is bounded by the distal slope of the distal cusp, the distal marginal ridge and the distal slope of the Distolingual cusp. The central groove has its other terminal in this fossa.

Buccal and lingual supplemental grooves are less common here. An extension of the central groove quite often crosses the distal marginal ridge, however, lingual to the distal contact area.

Starting at the central pit in the central fossa, the central developmental groove travels an irregular course mesially, terminating in the mesial triangular fossa.

A short distance mesially from the central pit, it joins the Mesiobuccal developmental groove.

The latter groove courses in a Mesiobuccal direction at the bottom of sulcate groove separating the Mesiobuccal and distobuccal cusp.

At the junction of the cusp ridges of those cusps, the Mesiobuccal groove of the occlusal surface is confluent with the Mesiobuccal groove of the buccal surface of the crown.

The lingual developmental groove of the occlusal surface is an irregular groove coursing in a lingual direction at the bottom of the lingual sulcate groove to the junction of the lingual cusp ridges, where it is confluent with the lingual extension of the same groove.

Again starting at the central pit, the central groove may be followed in a distobuccal direction to a point where it is joined by the distobuccal developmental groove of the occlusal surface.

From this point, the central groove courses in a Distolingual direction, terminating in the distal triangular fossa.

The distobuccal groove passes from its junction with the central groove in a distobuccal course, joining its buccal extension on the buccal surface of the crown at the junction of the cusp ridges of the distobuccal and distal cusps.

The central developmental groove seems to be centrally located to the buccolingual crown dimension.

This arrangement makes the triangular ridges of lingual cusps longer than the triangular ridges of buccal cusps.

PULP CAVITY

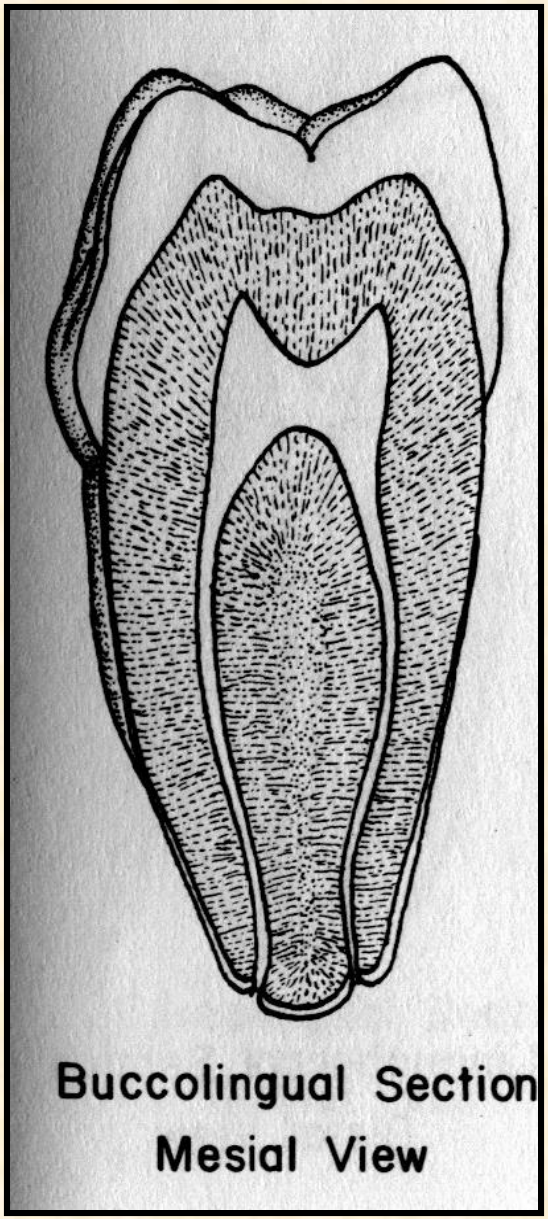
BUCCOLINGUAL SECTION:

The buccolingual cross section of the mandibular first molar demonstrates a generous pulp chamber that may extend well down into the root formation.

The mesial root usually has more complicated root canal system because of the presence of two canals.

The distal root usually has one large canal, but two canals are often present.

Occasionally there may be a fourth canal that has its own separate root but this is infrequent.

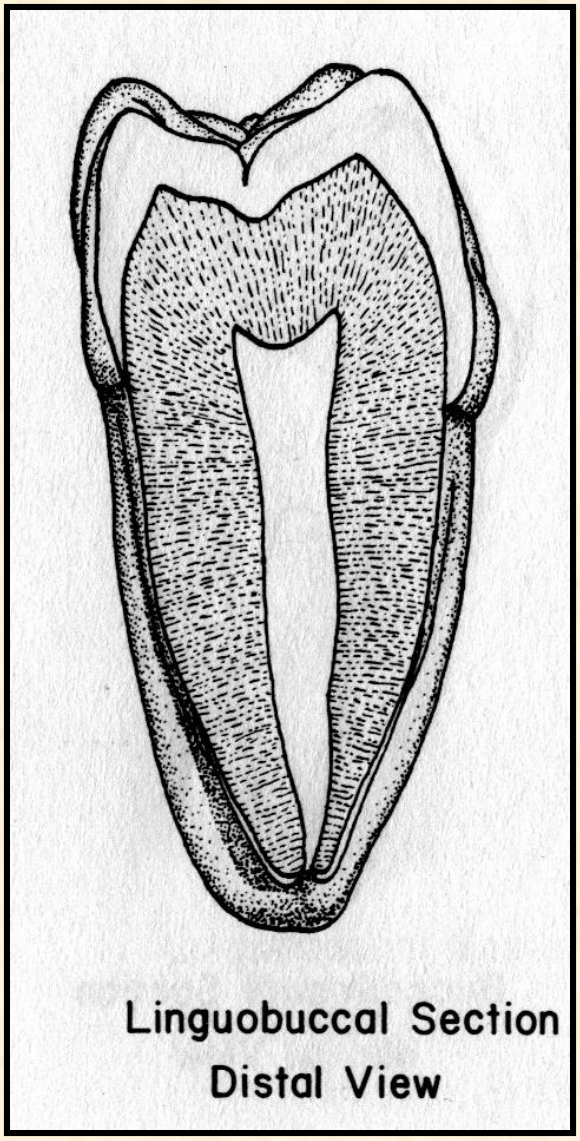


RIGHT SIDE

The pulp horns are quite prominent in most of the mandibular first molars, whereas the pulp horns of some of the mandibular first molars are quite small.

The pulp chambers of the mesial roots are rectangular in shape but this demarcation is not seen in the single-canaled distal root.

The mesial canal may be severely curved, moderately curved or relatively straight. The two canals may join each other in the apical region to exit in a common foramen or they may have a separate apical foramen.



The apical foramen usually appears to exit on the tip of the broad mesial root but some roots have one of the two canal exit on the side of the root tip.

The diameter of the mesial canals is usually very small and demonstrates a slight taper.

The distal root usually has one large pulp chamber, which is very wide in the buccolingual dimension, whereas other distal roots may possess a pulp chamber that is more constricted.

The distal root usually has one large pulp canal, which may show a considerable buccolingual dimension until the canal constricts abruptly a few millimeters from the apex of the root.

The constriction of the canal, in the last few millimeters of the root, is not always present

When two canals are present, they will be partially or completely separated by a dentinal island.

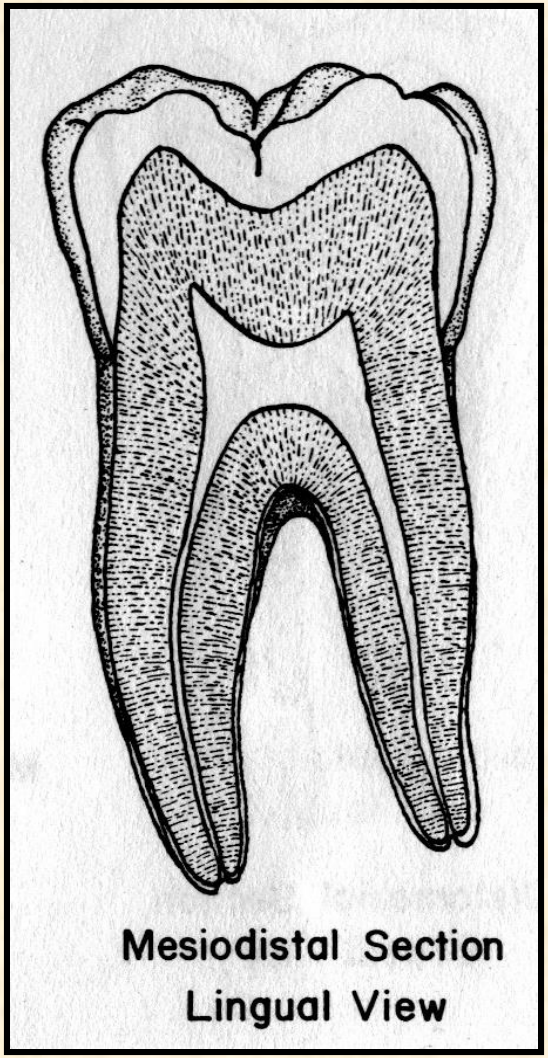
The apical foramen of the single-canaled distal root usually appears to be located at the apex of the root but it may be slightly buccal or lingual to the apex of the root.

MESIODISTAL SECTION:

The mesiodistal section of the mandibular first molar will present few variations in the form of the pulp chamber or canals.

The mesial and distal pulp cavities have canals and chambers that are centered within the roots and crowns.

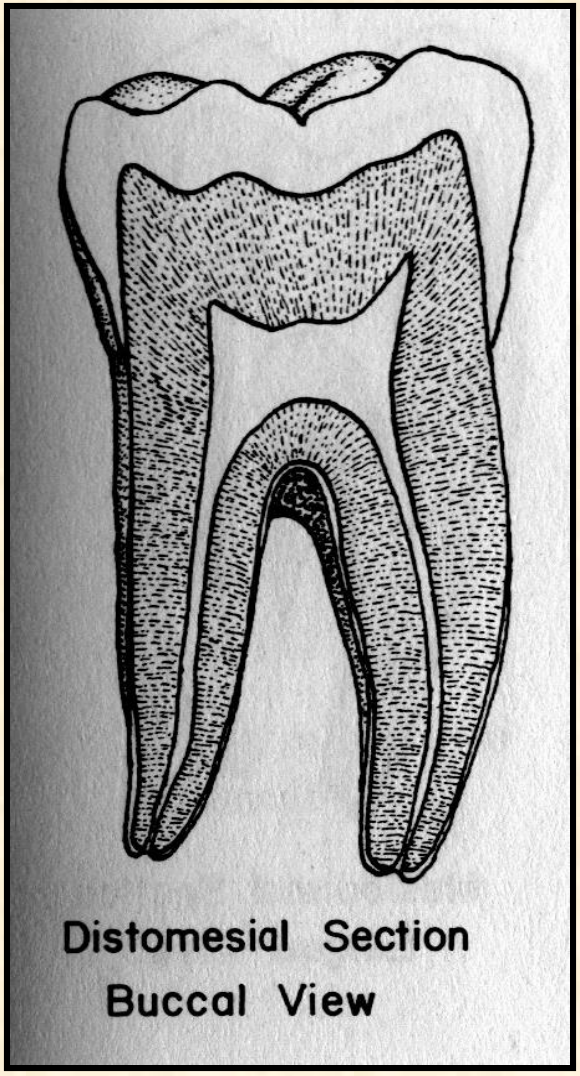
The pulp horns may be prominent, moderately evident, barely detectable or possibly demonstrating a combination of these variations.



The pulp chambers are usually rectangular in shape and may be large or very small.

Mandibular first molars showing a very small pulp chamber should be approached with caution while gaining access for endodontic purposes, as a furcation perforation can occur quite easily.

The mesial root and canal usually show considerably curvature. Those that are not curved may be easier to negotiate with an endodontic file unless the canal is calcified.



The apical foramen usually appears to exit at the tip of the root, whereas others appear to exit on the mesial or distal aspect of the root.

The distal root is usually straighter and tends to be a little shorter than the curved mesial root. However, it may be the same length or even slightly longer.

The distal canal usually tapers gently to the constriction. The apical foramen often appears to be located on the distal aspect of the root.

In some teeth, this distal deviation will be quite marked. Although mesial deviation of the canal is rare, it does occur; however, it is usually only a minor deviation.

The apical foramen will often appear to be located at the tip of the root.

Access to the canals of the mandibular first molar should allow the endodontic instrument to pass freely into and out of the canals.

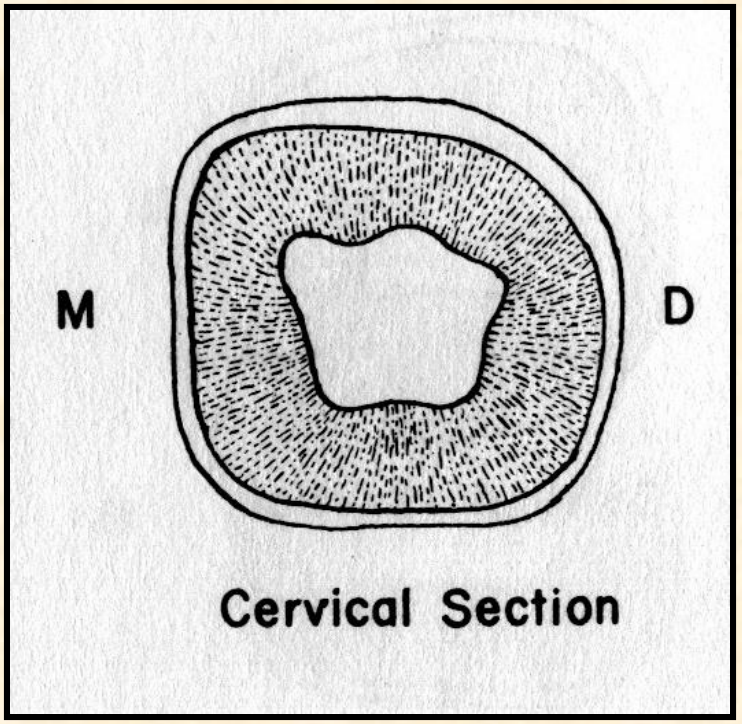
Because of the root canal's curvature or angle, the files will cross one another in the cervical region of the tooth.

CERVICAL CROSS SECTION:

The cervical cross section of the mandibular first molar is generally quadrilateral in form.

Distally, it tapers a little from the wider buccolingual measurement of the mesial aspect of the tooth.

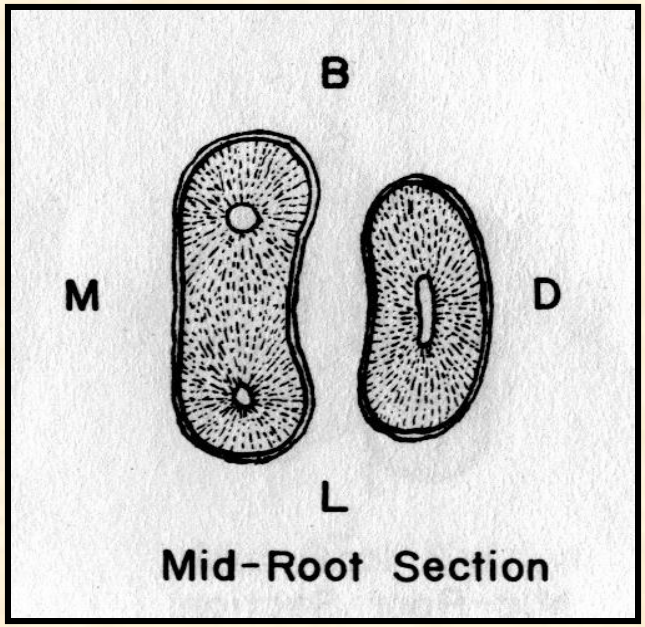
The pulp chamber outline generally follows that of the root but may show buccal and/or lingual projections of dentin if the pulp chamber is excessively narrowed by secondary or irritation dentin.



The pulp chamber floor has two small funnel-shaped openings into the mesial root, whereas the distal aspect of the pulp chamber shows a single opening that is less constricted

MIDROOT CROSS SECTION:

The midroot view of the mandibular molar will usually demonstrate the root canal form, which is consistent with the major form of this tooth.



The mesial root will usually be somewhat kidney-shaped, with two separate canals but a figure 8 shape of the root is also very common. The two canals may be totally separate or confluent with the other canal.

The distal root is usually rounder than the mesial root but a very wide root is very common.

Those roots that tend to be round usually demonstrate only one canal, whereas the broader distal roots tend to have two canals or a very thin canal that is single; or they may possess a dentinal “island”.

Even the single – canaled distal canal tends to show a developmental depression or concavity on the mesial aspect of the root and this should be considered when postpreparations are being considered.

MANDIBULAR 2nd MOLAR

The mandibular second molar supplements the first molar in function. Its anatomy differs in some details.

Normally, the second molar is smaller than the first molar by a fraction of a millimeter in all dimensions. It does not, however, run true to form.

It is not uncommon to find mandibular second molar crowns somewhat larger than first molars, and although the roots are not as well formed, they may be longer.

The crown has four well-developed cusps: two buccal and two lingual, of nearly equal development. There is neither a distal nor a fifth cusp, but the distobuccal cusp is larger than that found on the first molar.

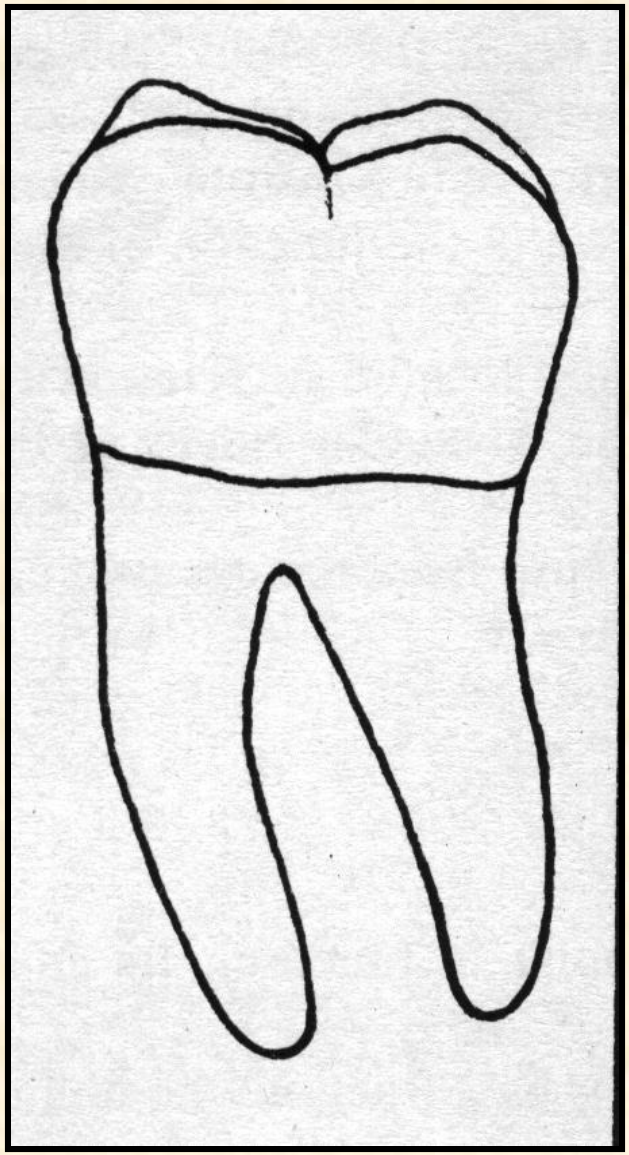
The tooth has two well-developed roots, one mesial and one distal. These roots are broad buccolingually, but they are not as broad as those of the first molar, nor are they as widely separated.

BUCCAL ASPECT:

The crown is somewhat shorter cervico-occlusally and narrower mesiodistally than in the first molar.

The crown and root show a tendency toward greater overall length, but are not always longer.

There is but one developmental groove bucally, the buccal developmental groove.



LEFT SIDE

This groove acts as a line of demarcation between the Mesiobuccal and the distobuccal cusps, which are about equal in their mesiodistal measurements.

The cervical line bucally in many instances points sharply toward the root bifurcation.

The roots may be shorter than those of the first molar, but they vary considerably in this as well as in their development generally.

The roots are usually closer together, and their axes are nearly parallel. They may spread as much as those of the first molar or they may be fused for all or part of their length.

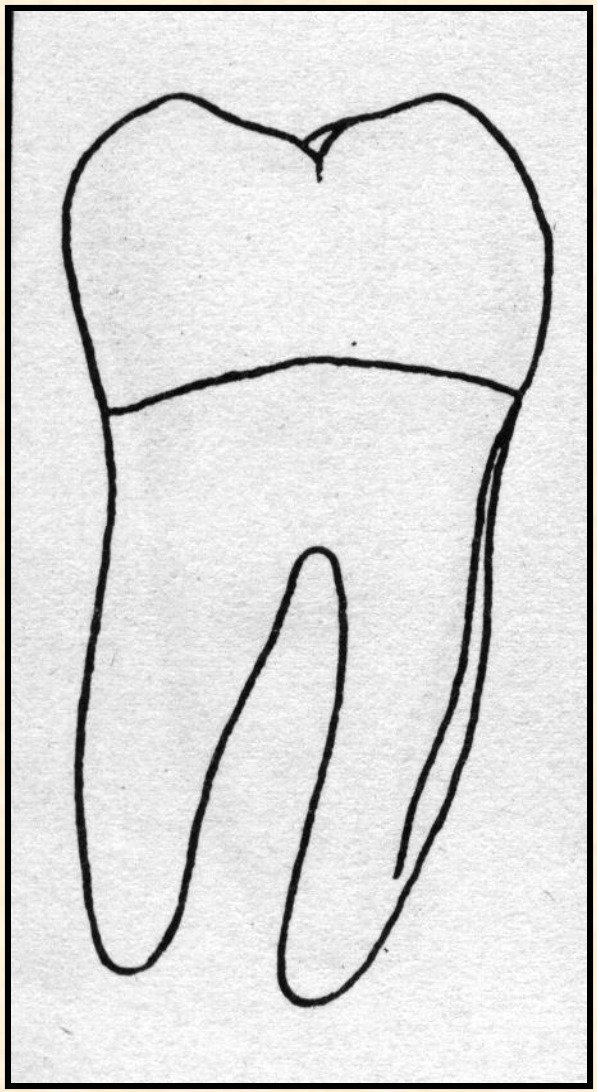
The roots are inclined distally in relation to the occlusal plane of the crown, their axes forming more of an acute angle with the occlusal plane than is found on the first molar.

When one compares all of the mandibular molars, it may seem that the first molar shows one angulation of roots to occlusal plane, the second molar a more acute angle and the third molar an angle which is more acute still.

LINGUAL ASPECT:

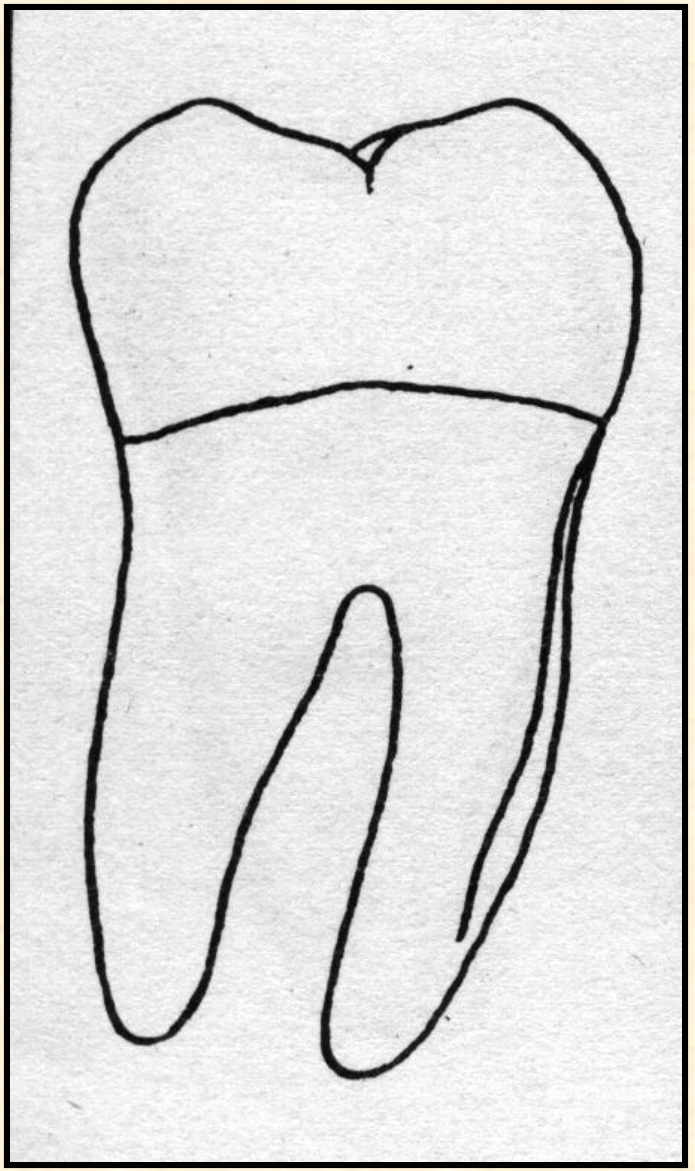
Differences in detail between the mandibular second molar and the mandibular first molar, to be noted from the lingual aspect, are these:

1) The crown and root of the mandibular second molar converge lingually but to a slight degree; little of the mesial or distal surfaces may therefore be seen from this aspect.



2) The mesiodistal calibration at the cervix lingually is always accordingly than that of the first molar.

3) The curvatures mesially and distally on the crown that describe the contact areas are more noticeable from the lingual aspect. They prove to be at a slight lower level, especially in the distal area, than those of the first molar.



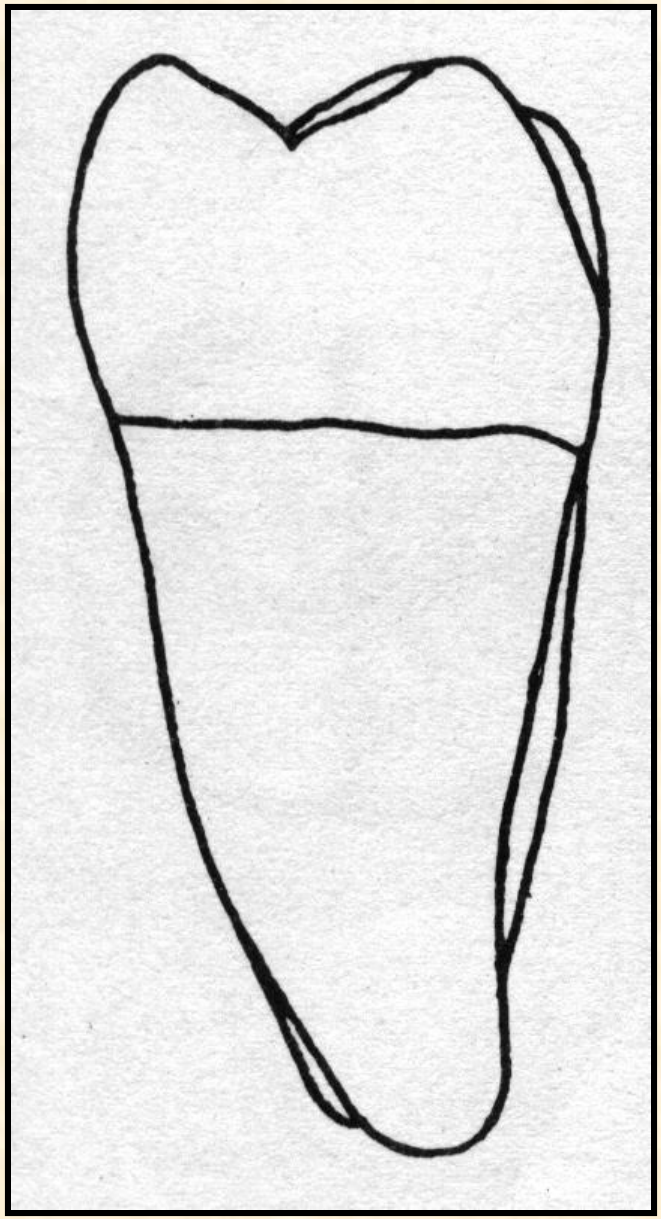
MESIAL ASPECT:

Except for the differences in measurement from the mesial aspect, the second molar differs little from the first molar.

The cervical ridge bucally on the crown portion is in most instances less pronounced, and the occlusal surface may be more constricted buccolingually.

The cervical line shows less curvature, being straight and regular in outline buccolingually.

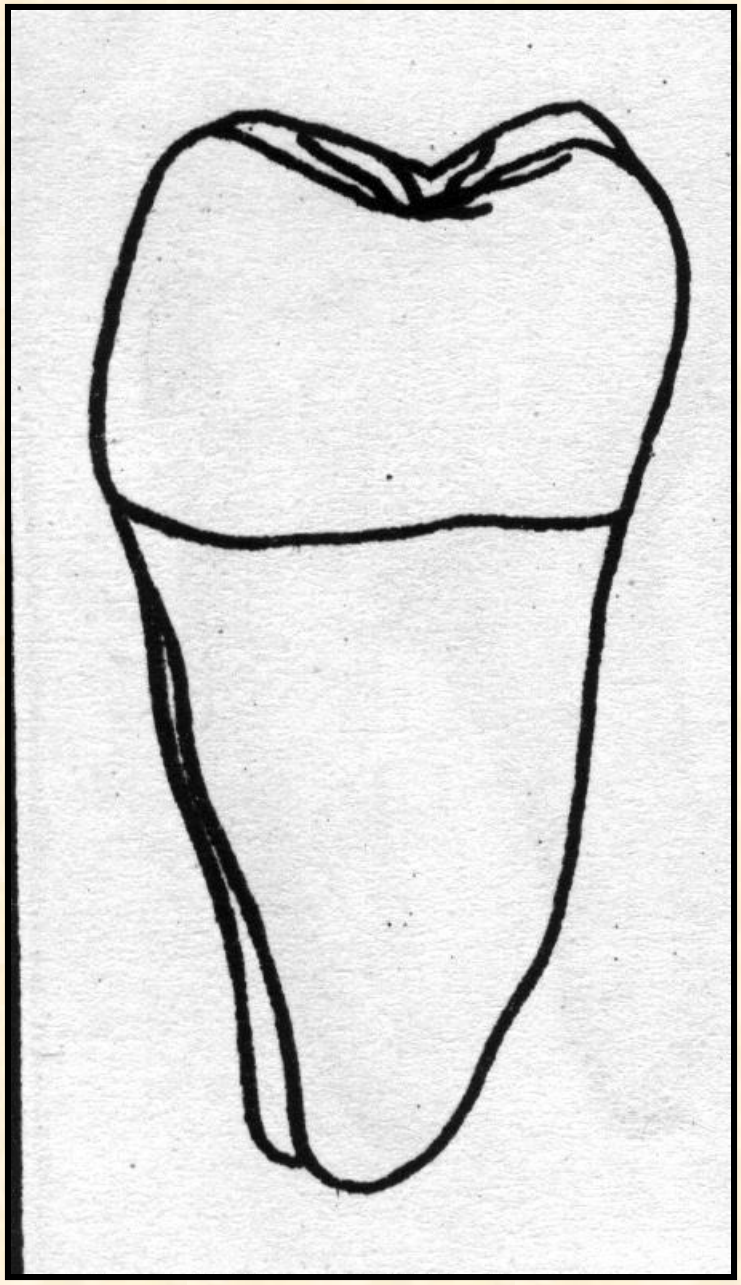
The mesial root is somewhat pointed apically. If part of the distal root is in sight, it is seen bucally. In the first molar, when the distal root is in sight from the mesial aspect, it is in view lingually.



DISTAL ASPECT:

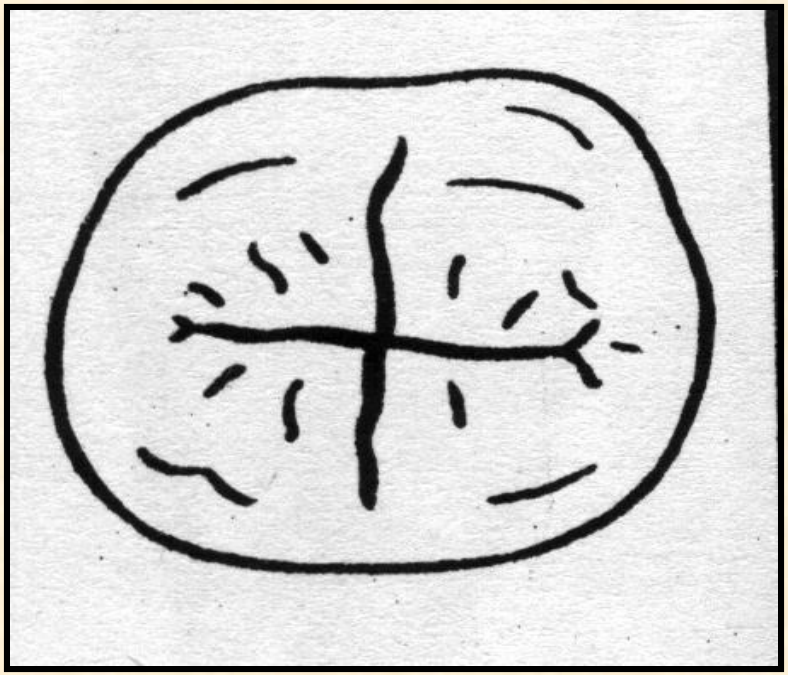
From the distal aspect, the second molar is similar in form to the first molar except for the absence of a distal cusp and distobuccal groove.

The contact area is centered on the distal surface buccolingually and is placed equidistant from cervical line and marginal ridge



OCCLUSAL ASPECT:

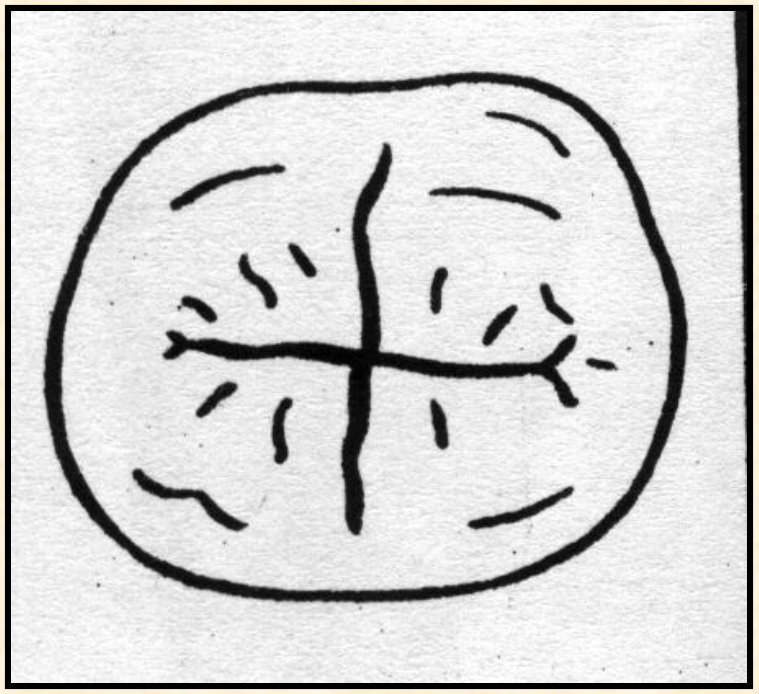
The occlusal aspect of the mandibular second molar differs considerably from the first molar. These variations serve as marks of identity.



The small distal cusp of the first molar is not present, and the distobuccal lobe development is just as pronounced, and sometimes more so, than that of the Mesiobuccal lobe.

There is no distobuccal developmental groove occlusally or bucally. The buccal and lingual developmental grooves meet the central developmental groove at right angles at the central pit on the occlusal surface.

These grooves form a cross, dividing the occlusal portion of the crown into four parts that are nearly equal.



The following characteristics of mandibular second molars from the occlusal aspect should be observed and noted:

1) Many of them are rectangular from the occlusal aspect.

2) Many show considerable prominence cervically on the Mesiobuccal lobe only.

3) Most second molars exhibit more curvature of the outline of the crown distally than mesially, showing a semicircle outline to the Disto-occlusal surface in comparison with a square outline mesially.

4) The cusp ridge of the distobuccal cusp lies buccal to the cusp ridge of the Mesiobuccal cusp.

PULP CAVITY

Anatomically, the mandibular second molar has many similarities with the mandibular first molar.

The proportions of the crown and root are very similar to the mandibular first molar.

The roots of the second molar may be straighter with less divergence from the furcation than in the first molar.

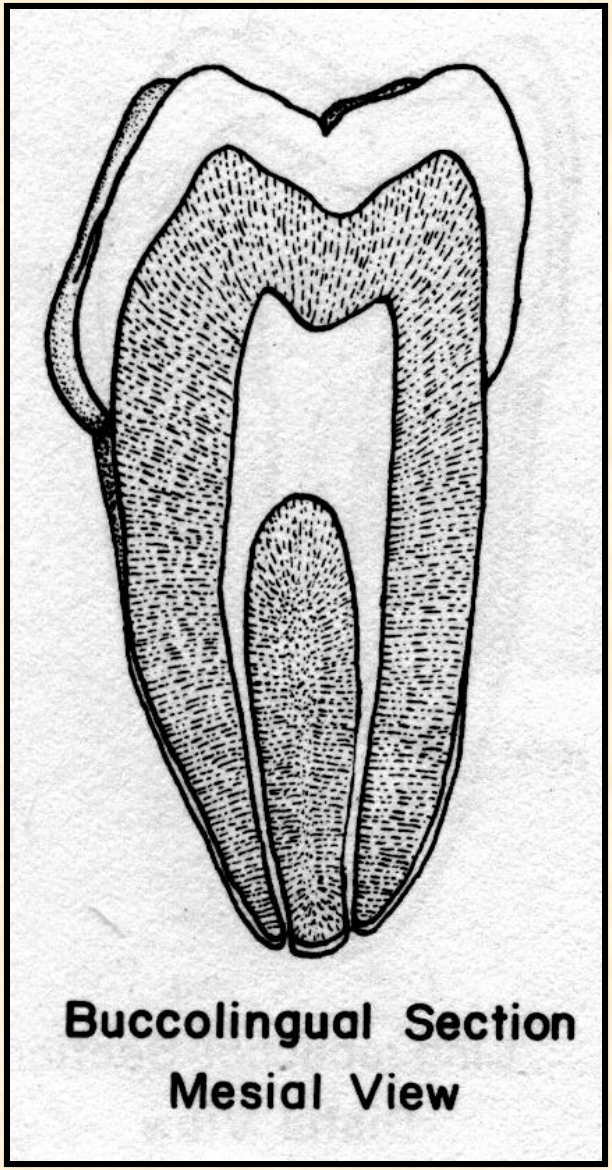
The roots may be shorter, but there is no assurance that any of these differences will be manifested in any one case.

BUCCOLINGUAL SECTION:

The buccolingual section of the mandibular second molar demonstrated a pulp chamber and pulp canals that tend to be more variable and complex than those found in the mandibular first molar.

The pulp horns of the mandibular second molar are usually rather prominent but some pulp horns may be small to nonexistent.

The pulp chamber of the mesial root is well demarcated because of the presence of two small canals.



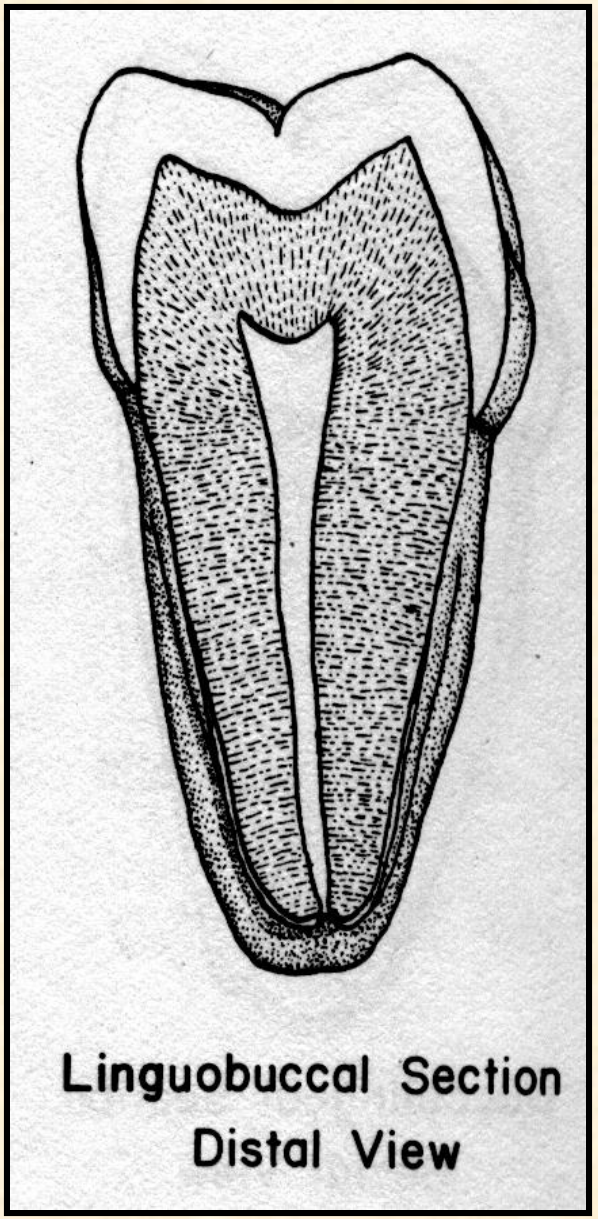
RIGHT SIDE

The pulp chamber may be somewhat square or rectangular in shape.
Two root canals are usually present in the mesial root, but only one may be present.

The mesial canals may show a large, medium or small dimension.

The curvature of these canals may be severe, moderate , virtually absent or a combination of the aforementioned variations

Most of the canals will appear to exit from the mesial root separately but some join just prior to reaching the apex so that there is a common canal that exits from the apex.



The apical foramen usually appears to be located at the tip of the root, but some appear to exit slightly to the buccal or lingual aspect of the apex of the root.

The pulp chamber of the distal root of the mandibular second molar is not as easily identified because of the extremely large pulp canal that is usually present.

One canal is usually present in the distal root, but two totally or partially separate canals are possible.

The pulp horns may be present, but they are not nearly as prominent as in the mesial root unless two canals are present. The pulp canal is usually very large in the Mesiobuccal sections.

The pulp canal may taper gently from the pulp camber until the apical constriction or an abrupt constriction of the canal may occur in the last 2 or 3 mm of the canal.

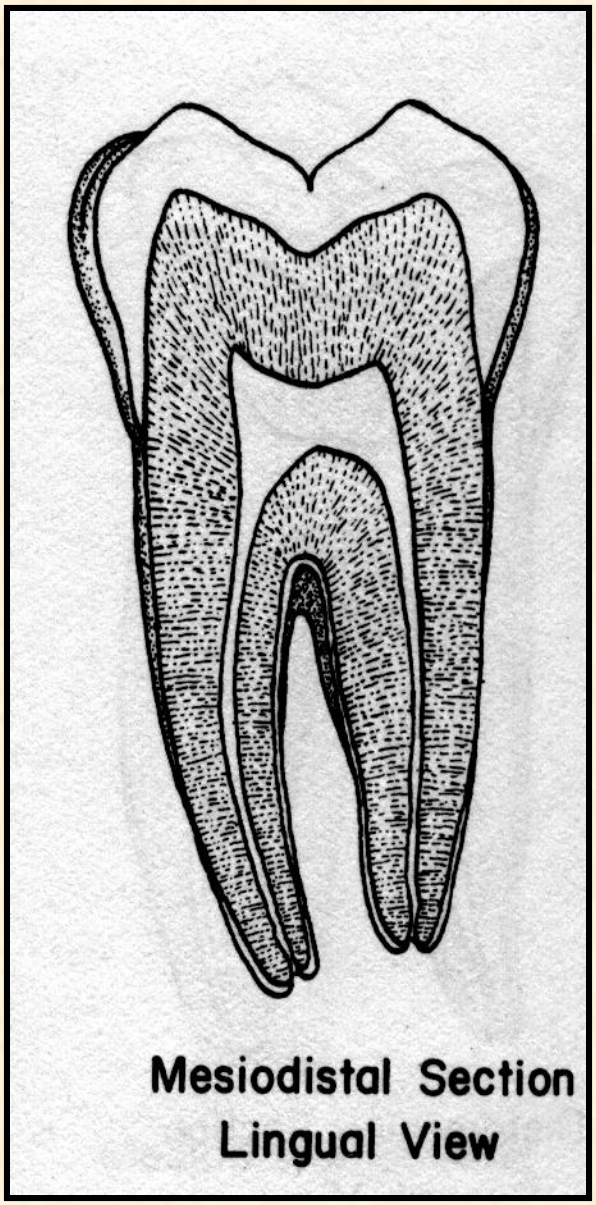
The apical foramen usually appears to be located at the tip of the root, but this is not always the case.

MESIODISTAL SECTION:

The mesiodistal sections of the mandibular second molar are very similar to those of the mandibular first molar. However, the roots of the mandibular first molar tend to be straighter and closer together.

The pulp horns are usually prominent, but some are small or absent. The pulp chamber is rectangular in shape.

The size of the mesial chamber varies from very large to very small. The curvature of the mesial canal may be severe, moderate or essentially straight.



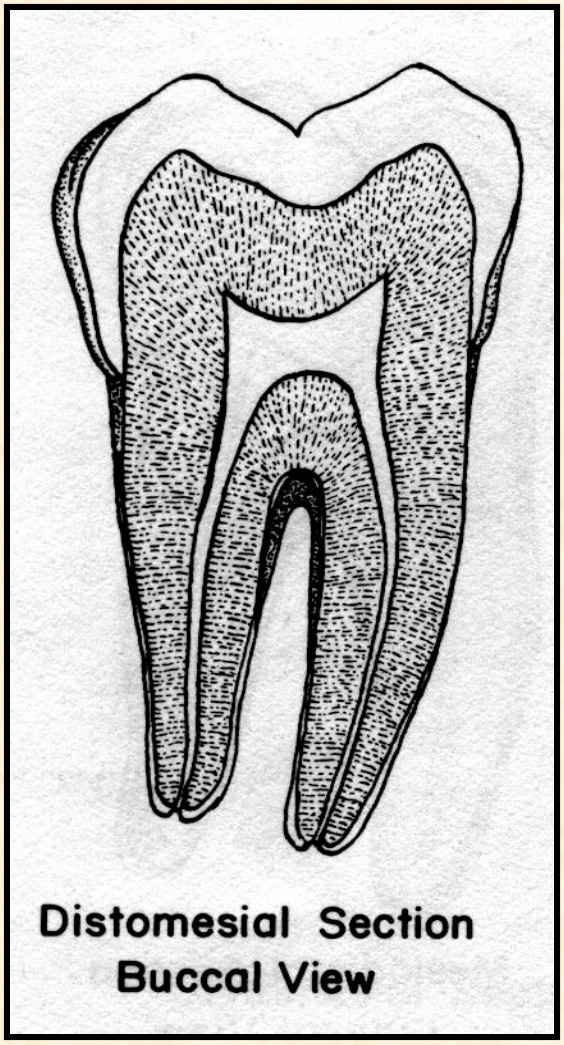
The canals gently taper from the pulp chamber to the apical constriction. The apical foramen usually appears to be located at the tip of the root, but the foramen may appear to be located mesially or distally on the root tip.

The distal canal may be slightly curved or straight.

The distal root may be slightly shorter than, equal to or longer than the mesial root.

The distal canal is usually larger than the mesial canals but may be equal to the mesial canals.

The distal canal tapers gently to the apex.

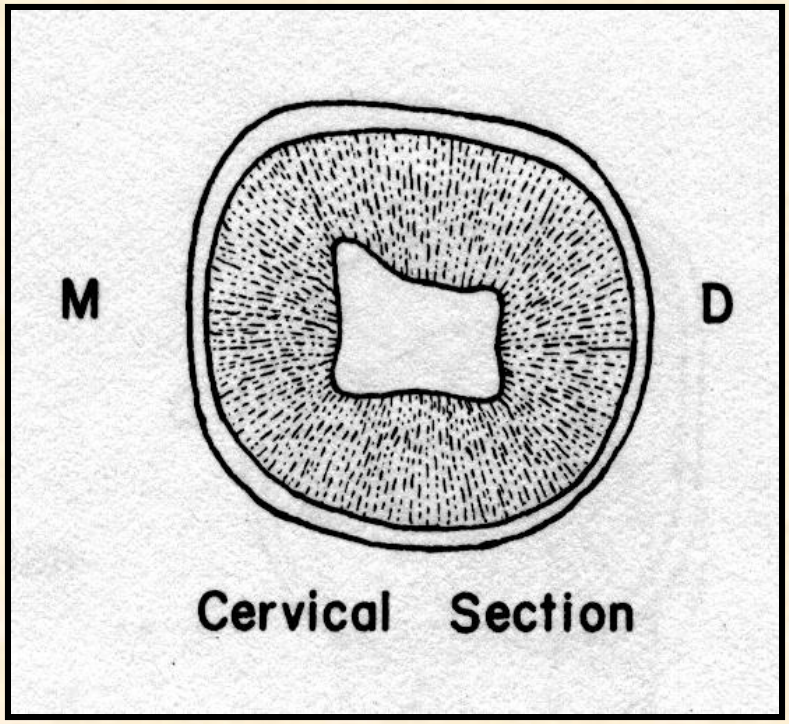


CERVICAL CROSS SECTION:

The cervical cross section of the mandibular second molar is similar to that of the mandibular first molar.

The outline form of the mandibular second molar is more triangular because of the smaller dimensions that are usually seen in the distal aspect of this tooth.

The pulp chamber also tends to be triangular in form.



The floor of the pulp chamber may have two opening, one mesially and one distally, which are centered within the dentin.

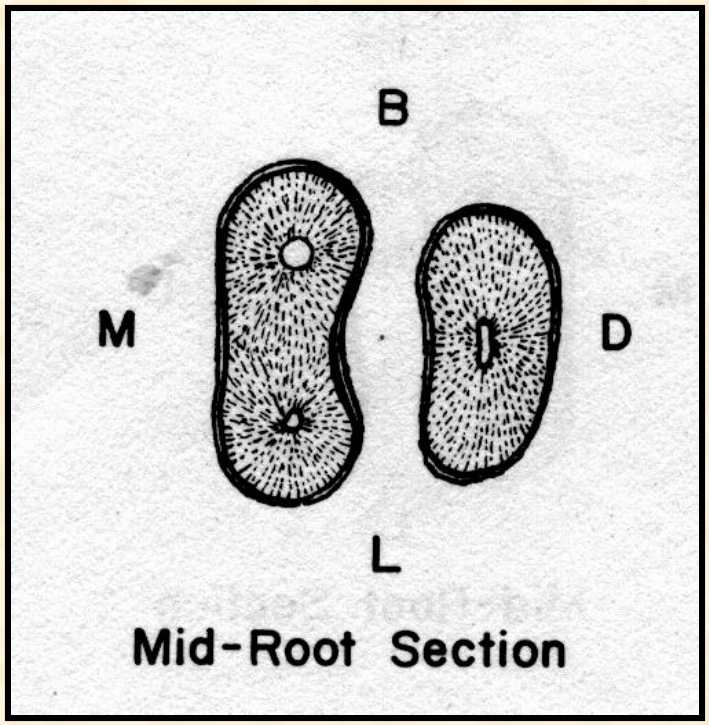
If only one canal is present in the distal root, it will be centered within the dentin.

MIDROOT CROSS SECTION:

Midroot cross sections of the mandibular molars will demonstrate the very broad and narrow mesial root.

The outline form will be kidney-shaped or slightly in the form of a figure 8.

The canals may be totally separate or confluent making it difficult to determine the presence of two mesial canals.



The distal root may be rounder than the mesial root because the outline form of this root us usually oval, but broad distal roots are also seen.

One canal is usually present in the distal canal, but two canals are possible.

Access to the pulp chamber and canals of the mandibular second molar is similar to that of the mandibular first molar.

Because of these similarities, the departure of the files from the tooth will be the same as found in the mandibular first molar.

THANK U