

# locating elusive root canals in molar teeth - some useful landmarks

a *Dental Outlook* special report

## 1 Background <sup>1</sup>

With aging patients who have retained their teeth, finding root canals in teeth that require endodontics can be quite difficult and time consuming.

Pulp space decreases throughout life by the deposition of regular secondary dentine. In addition there can be the formation of calcific deposits such as pulp stones.

With anterior teeth, the pulp retreats progressively in an apical direction becoming narrower and often leaving no soft tissue within the crown at all.

In the case of molar teeth this deposition occurs most commonly in the pulp horns and on the floor and roof of the pulp chamber. This can convert a pulp chamber from an original large rectangular cavern to nothing more than a flat disc.

Consequently, situations can occur when preparing an access cavity in a molar tooth, that the small chamber is traversed without the operator realising it. Sometimes additional tooth structure may be then sacrificed in a fruitless search for the chamber and the canal openings.

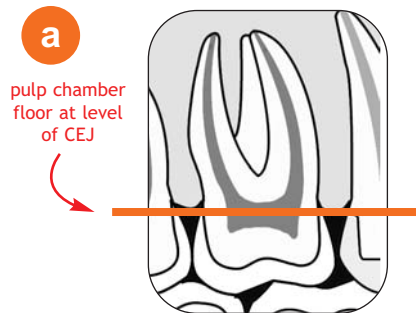
## 2 Useful landmarks

A recent report provided details of some useful landmarks using the cemento-enamel junction (CEJ) as a reference point. <sup>2</sup>

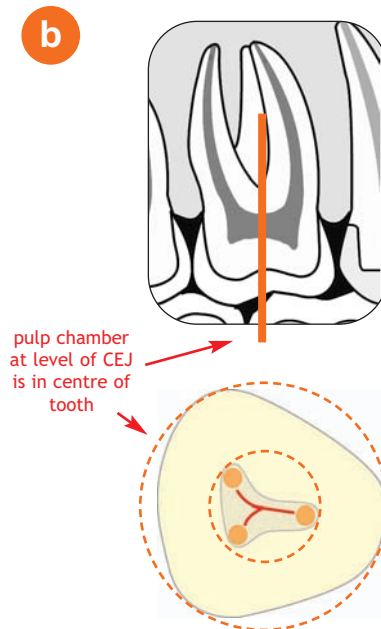
Some of the points that were made include:

1. The pulp chamber is always at the centre of the tooth at the level of the CEJ.
2. The openings to root canals are equidistant from the external surface of the tooth.
3. In the teeth that have grooves on the pulp chamber floor, the grooves lead to the canal openings.
4. In lower molars with 3 canals, the 2 mesial canals are equidistant from a line drawn mesio-distally through the pulp chamber. In molars with 4 canals, the 2 mesial and 2 distal canals follow the same pattern.

### Using the CEJ landmarks



When searching for a pulp chamber, it is useful to know that the floor of a pulp chamber invariably corresponds very closely with the level of the cemento-enamel junction (CEJ).



It is also useful to know that at the level of the CEJ, the pulp chamber is in the centre of the tooth.



## locating elusive root canals... (cont)

### 3 Before starting <sup>1, 3</sup>

Before placing a bur on a tooth to prepare an access cavity it is advisable to have the following:

- Good pre-operative radiographs to show the size and depth of the pulp chamber, as well as the number, size and direction of the roots and root canals.

Bitewing radiographs can be of great benefit when estimating the size of the pulp chamber and the distance from the occlusal surface to the roof of the chamber.

- Place the bur to be used for entry against a bite-wing radiograph to determine the exact depth the bur should penetrate.
- Magnification, good direct light and a fibre-optic light are prerequisites. With magnification alone an operator is three times more likely to locate elusive canals than would be the case without such help. As shown on the next page a fibre-optic light placed under the rubber dam and directed at the gingival margin will pick up many elusive openings.

### 4 Access preparation <sup>1, 3</sup>

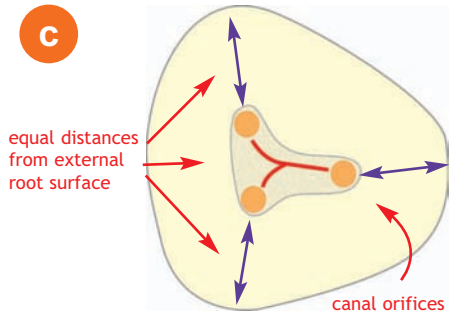
When preparing an access cavity it is better to err on the side of caution.

1. Start access preparation with the high speed bur in line with the long axis of the tooth. Some operators prefer to use a diamond bur and others a tungsten carbide bur. Remember the pulp is in the *centre* of the tooth at the level of the cemento-enamel junction (CEJ).
2. If the bur reaches a point in the centre of the tooth at the level of the CEJ and the pulp chamber has not been reached **stop** and re-assess the situation. This is the point where the bur may be going off track or one may have unknowingly gone past the pulp chamber.

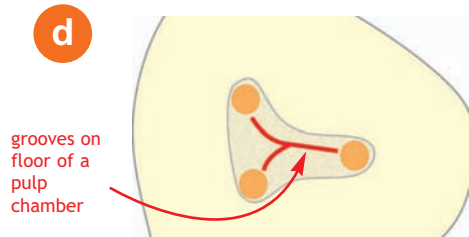
If in doubt do not proceed any further and refer the patient to an endodontist.

3. Once the pulp chamber has been reached use a safe-ended diamond bur to cut laterally and finish the access preparation. It is important that the access cavity has no overhangs to prevent a clear vision of the canal openings.

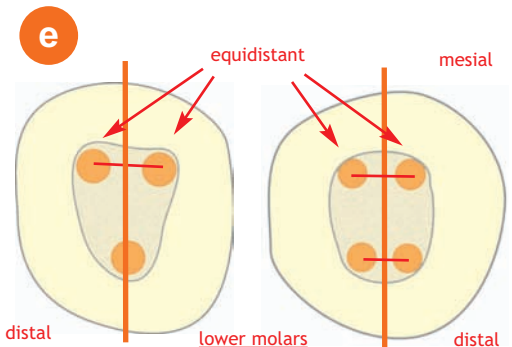
#### Using the CEJ landmarks (cont)



At the level of the CEJ, another location aid is that each canal orifice is the same distance from the external root surface.



Grooves on the floor of a pulp chamber lead to the canal orifices and so can provide a useful 'road map'.



In lower molars with 3 canals, the 2 mesial canals are equidistant from a mesio-distal line as shown. In molars with 4 canals, the 2 mesial and 2 distal canals follow the same pattern.

# locating elusive root canals... (cont)

## 5 Finding the canal openings <sup>1, 3</sup>

### Upper first and second molar teeth:

The palatal canal is the largest canal in these teeth. Locate this canal first because it is the easiest to find and will act as a reference point for finding the orifices of the smaller buccal canals.

There is a high incidence of two canals in the mesio-buccal root particularly in upper first molars and it is safest to assume there are two unless proved otherwise.

### Lower first and second molar teeth:

Mandibular first molar teeth are possibly one of the most endodontically-treated teeth. They can also have a complicated canal system.

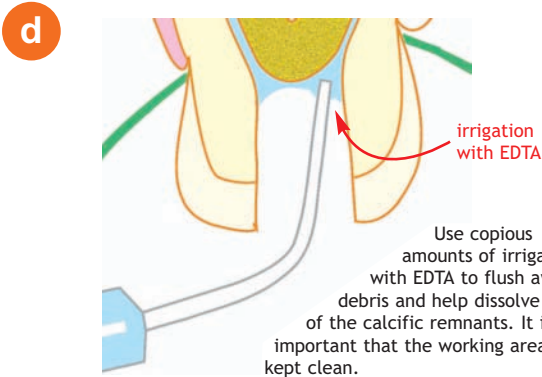
As with the upper molar teeth locate the largest canal, the distal canal, first as this can provide a guide to the other openings.

If the distal canal is not in the middle, or is small, search for a second distal canal. In such circumstances, it is the disto-lingual canal which is frequently missed.

### References

1. Finbarr Allen P, Whitworth JM. Endodontic considerations in the elderly. *Gerodontology* 2004;21:185-194.
3. Krasner P, Rankow HJ. Anatomy of the pulp-chamber floor. *J Endod* 2004;30:5-16.
3. Christie WH, Thompson GK. The importance of endodontic access in locating maxillary and mandibular molar canals. *J Canad Dent Assoc* 1994;60:527-536.

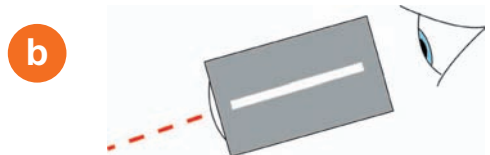
The helpful suggestions of Dr Alex Moule in the preparation of this article is gratefully acknowledged.



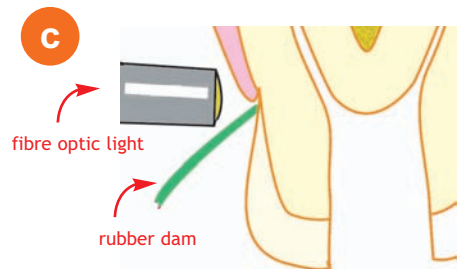
### A few clinical tips



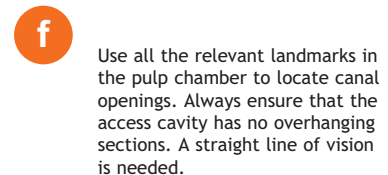
Before starting examine the radiographs carefully. Measure the distance from the occlusal surface to the pulp chamber by holding the bur up to a radiograph. A bite-wing radiograph can be very useful for this purpose.



Always use strong light and some form of magnification.



Use transillumination from a fibre optic light placed *under* the rubber dam and directed at the gingival margin. By moving the light around it is surprising what can be revealed.



Use all the relevant landmarks in the pulp chamber to locate canal openings. Always ensure that the access cavity has no overhanging sections. A straight line of vision is needed.