

Endodontic access and beyond: part one

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Introduction

Access isn't just about drilling a hole – it's about designing the right entry for each tooth. Can you achieve straightline access while preserving dentine and maintaining structural integrity?

One size does not fit all. Ignoring anatomy, restorations, or case complexity invites avoidable errors that can compromise treatment outcomes. Endodontic success starts with the right access. It dictates how effectively you can locate, clean and shape the canal system.

When access is planned and executed well, it allows for:

- Straightline entry for efficient instrumentation
- Thorough disinfection without unnecessary dentine removal
- Lower risk of procedural errors like perforations or missed canals.

However, when access is compromised – by poor angulation, over-preparation or missed anatomy – it increases the likelihood of failure. Many retreatments and iatrogenic mishaps stem from errors in access design rather than canal instrumentation. Despite its critical role, access preparation is often rushed or overlooked, especially in time-sensitive clinical settings. This article will help you refine your approach, ensuring that every access cavity is precise, predictable and preserves structural integrity.

Re-evaluating your access approach: a case reflection

Consider the three lower first molars in Figures 1a to 1c – they were all diagnosed with irreversible pulpitis (hypothetically all in patients the same age, say 35 years old) As Table 1 highlights, although the diagnosis is identical, the clinical complexity and access challenges vary significantly.

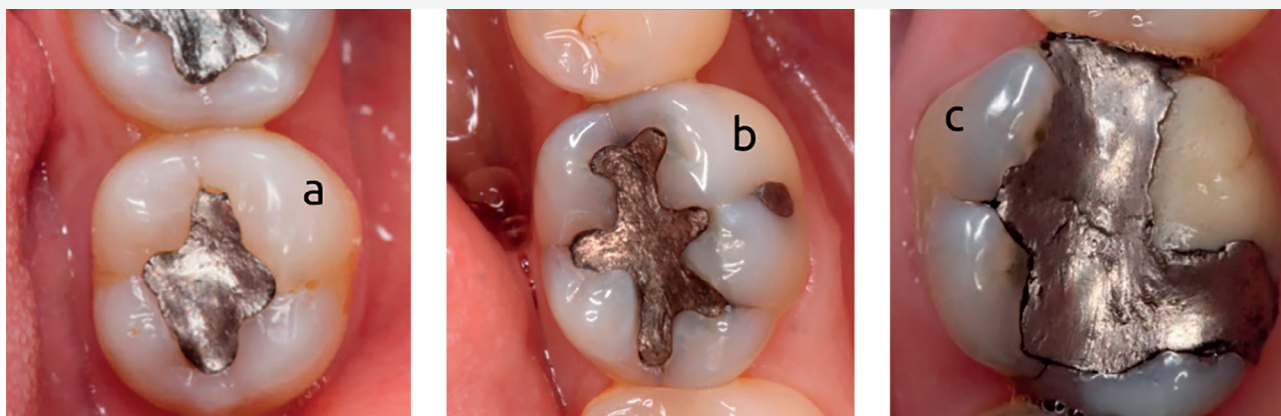
There had been minimal restoration of the lower first molar shown in Figure 1a and the pulp chamber had a normal depth. Access was deemed straightforward and typical anatomical landmarks were intact.

The lower first molar shown in Figure 1b had a large occlusal amalgam restoration and potential pulp chamber shrinkage. While the landmarks were useable as references, there were thin marginal ridges.

While the lower first molar shown in Figure 1c had been heavily restored, with a reduced pulp chamber and possible pulp calcification. In addition, the cemento-enamel junction (CEJ) landmarks were obscured, and the chamber depth was deemed unpredictable. This could mean multiple radiographs would be required.

Each of these cases requires immediate treatment, but their clinical complexity varies. Would you approach access the same way in all three? Probably not.

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Figures 1A to 1C: Three lower first molars all diagnosed with irreversible pulpitis but different clinical complexity and access challenges

Figure	Diagnosis	Clinical complexity	Additional considerations
1A	Irreversible pulpitis without apical periodontitis	Minimal restoration, normal pulp chamber depth	Straightforward access, typical anatomical landmarks intact
1B	Irreversible pulpitis without apical periodontitis	Large occlusal amalgam restoration, potential pulp chamber shrinkage	Landmarks useable as references, but thin marginal ridges
1C	Irreversible pulpitis without apical periodontitis	Heavily restored, reduced pulp chamber and possible pulp calcification	CEJ landmarks obscured, chamber depth unpredictable, multiple radiographs may be required

Table 1: Diagnosis and difference in clinical complexity and additional considerations

Before you drill, key questions to ask:

1. What's my depth reference? If occlusal landmarks are unreliable due to restorations or wear, how will you estimate pulp chamber location?
2. How will I modify my access based on the case? Will you adjust for deep restorations, pulp calcifications, or atypical anatomy?
3. Can I complete this efficiently? If a patient is in pain and treatment needs to be swift, how do you balance speed with precision?
4. What's my back-up plan? If the pulp chamber is shallower or deeper than expected, or if canals aren't where you thought they'd be, what's your next move?

By critically evaluating your access approach before drilling, you minimise the risk of missed canals, perforations or excessive weakening of the tooth.

Locating access: understanding the black dots

When you begin your access procedure and are faced with what often looks like nothing but 'black dots', it can be challenging to locate the exact number and position of the canal orifices, especially in complex cases.

Krasner and Rankow (2004) shed light on this challenge with their study of 500 pulp chambers, which identified key anatomical patterns that can guide clinicians in locating pulp chambers and root canal orifices.

Their research is a pivotal resource, highlighting two primary categories of anatomical relationships:

- Relationships of the pulp chamber to the clinical crown
- Relationships of orifices on the pulp-chamber floor.

Let's explore some of the key findings from Krasner and Rankow (2004) study.

Relationships of the pulp chamber to the clinical crown

- Law of centrality: the floor of the pulp chamber is always located in the centre of the tooth at the level of the cemento-enamel junction (CEJ)
- Law of concentricity: the walls of the pulp chamber are always concentric to the external surface of the tooth at the CEJ
- Law of the CEJ: the CEJ is the most consistent and repeatable landmark for locating the pulp chamber position.

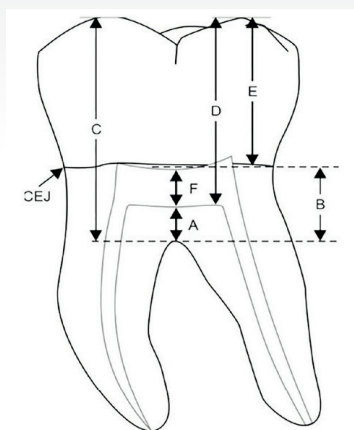


Figure 2: Distance of pulp chamber from various anatomical landmarks

Measurement (mm)	A	B	C	D	E	F
Mean	2.32 ± 0.47	3.80 ± 0.77	9.08 ± 1.03	6.83 ± 0.96	5.37 ± 0.79	1.48 ± 0.66
% CV	20.31%	20.33%	11.35%	14.16%	15.07%	44.61%

Table 2: Measurements of mandibular molars in relation to pulp chamber (Lokade, Baheti and Chandak, 2011)

Relationships of orifices on the pulp-chamber floor:

- Law of symmetry: except for maxillary molars, the orifices of the canals are equidistant from a line drawn in a mesial-distal direction across the pulp-chamber floor
- Law of colour change: the pulp-chamber floor is always darker than the walls, helping to distinguish the floor from surrounding dentine
- Law of orifice location: the orifices of the root canals are located at the junction of the walls and the floor, at the angles formed by the floor-wall junction, and at the terminus of the root developmental fusion lines.

These anatomical laws, especially the law of the CEJ, provide a clear blueprint for locating the pulp chamber in any tooth, making it a reliable reference point when you begin your access preparation.

The cemento-enamel junction (CEJ): the north star of access preparation

Among all anatomical landmarks, the CEJ is the most reliable and consistent reference point for locating the pulp chamber.

Unlike occlusal landmarks – that can be altered by restorations, wear or attrition – the CEJ remains stable. While cusp tips or restoration margins can vary, the CEJ maintains a predictable relationship to pulp chamber depth, making it an essential guide for accurate access.

Why the CEJ matters in access preparation

- Restorative modifications? The CEJ stays the same – in cases where extensive restorations, caries, or coronal fractures obscure occlusal landmarks, the CEJ provides an objective and stable depth references
- Crowns and bridgework – even when artificial restorations mask natural tooth contours, the underlying

CEJ position remains unchanged, allowing for accurate depth estimation

- Tooth wear and ageing – over time, attrition and erosion may alter occlusal surfaces, but the CEJ-pulp relationship remains predictable.

Using the CEJ for depth control

Studies suggest that, in most cases, the distance from the CEJ to the pulpal floor is consistent, allowing clinicians to estimate the depth of penetration safely (Figure 2; Table 2).

For reference, in Figures 3 and 4, the total shank length to the head of the handpiece is 8mm, but use the blue band/line, which is 6mm, as your depth reference to the floor of the pulp from an intact cusp tip.

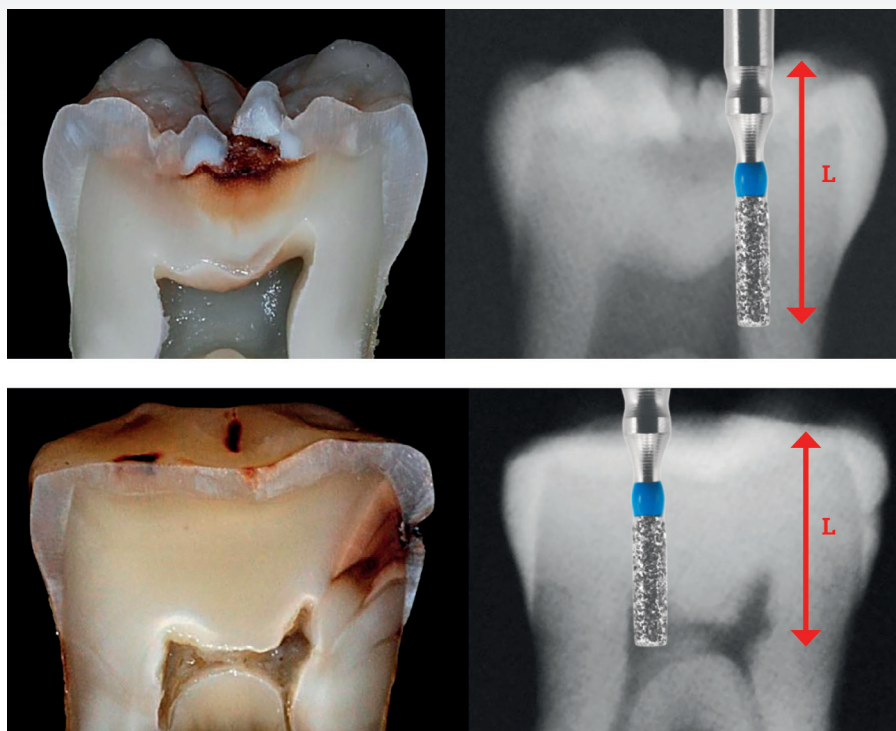
This measurement is crucial for depth control, as it aligns closely with the total depth from the cusp tip to the pulpal floor. Proper use ensures penetration is controlled, minimising unnecessary dentine removal and preventing the risk of perforation.

Understanding this relationship allows clinicians to anticipate when to stop drilling based on tactile feedback and radiographic planning. This aligns closely with the total depth from the cusp tip to the pulpal floor, reinforcing the need for careful depth control to avoid unnecessary dentine removal or perforation.

Armamentarium

Essential tools for every access cavity include:

- 541 diamond bur – ideal for initial penetration and depth control (8mm). This bur is particularly useful when dealing with heavily restored teeth, as its cutting efficiency allows for precise entry through composite or crown materials. It also provides predictable depth control, minimising the risk of over-preparation or under-preparation when accessing the pulp chamber



Figures 3 and 4: You can feel the drop when the height of the pulp chamber is larger enough. You cannot feel the drop when the height of the chamber is shallow (L=6mm)

- Endo-Z bur – refinement without overcutting
- DG16 explorer – essential for confirming canal orifices
- Magnification (loupes or microscope) – crucial for complex cases
- Ultrasonic tips – ideal for troughing calcified canals
- CBCT imaging (if needed) – when standard radiographs are insufficient.

The right armamentarium is crucial for efficient and predictable access cavity preparation. Incorrect tool selection can lead to over-preparation, missed canals or inadequate straightline access, all of which compromise treatment success.

The key to successful access

Mastering endodontic access requires more than technical skill – it demands preparation, anatomical knowledge and a structured approach.

The case reflection at the beginning of this article highlights how every tooth presents its own challenges, reinforcing the need for a thoughtful, case-by-case approach.

After reading this article, what will you change? The best clinicians refine their technique with every case – because in endodontics, every millimetre counts.

In part two of this series, we will delve into alternative

access designs – such as TEC, CEC, Truss and Ninja access – before addressing how to approach weakened teeth.

Key takeaways

- Use the cemento-enamel junction as your guide, particularly in heavily restored or worn teeth
- Customise access based on case complexity, adjusting for restorations, calcifications and variations in pulp chamber depth
- Employ magnification and digital imaging to enhance precision
- Select the right instruments for each step, from initial penetration to refinement.

References

- Krasner P, Rankow HJ. Anatomy of the pulp chamber floor. *J Endodon.* 2004; 30(1):5. *J Endod* 30(1): 5-16
- Lokade R, Baheti R, Chandak L (2011) Morphological measurements of anatomic landmarks in human mandibular molar pulp chambers – an in vivo study *J Kor Dent Sci* 4(1): 1-5

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