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A Simplified Clinical Technique for Locating Access Canals in Maxillary and Mandibular Molars (Teeth 16–47)

Dr. Imnatoshi Jamir (BDS), Dr. Unnati Agarwal (BDS, MDS)

Private Practice

JK Dental and Implant Clinic, Dimapur, Nagaland

Corresponding Author: Dr. Unnati Agarwal, JK Dental and Implant Clinic, Dimapur, Nagaland.

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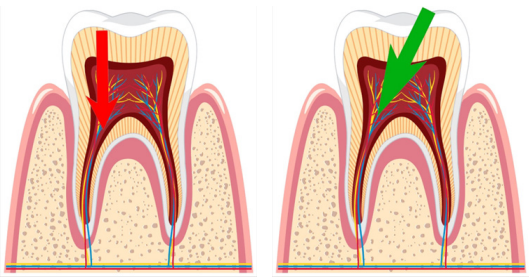
Abstract

Root canal success depends largely on accurate canal location.(1) Despite well-documented anatomical data, textbooks often fail to teach the practical aspect of canal inclination.(2) This paper presents a simplified, angle-based method for locating access canals in molars based on clinical experience. This technique aids in navigating curved canals and reduces the risk of procedural errors, especially in the hands of new graduates or general practitioners.

Introduction

Endodontic treatment in molars presents challenges due to anatomical complexity and canal curvature. (1,3) While textbooks describe anatomical positions, they often lack guidance on angulation and approach. (2) New graduates struggle with finding canals despite theoretical knowledge. (4) This paper introduces a practical technique that simplifies access based on anatomical orientation, intra-chamber landmarks, and controlled file angulation.

Although the canal orifice is approached perpendicular to the pulpal floor, to negotiate the root canals without hindrance and ledge formation these angulations should be practiced. (5)



Literature Review

Standard textbooks and many research studies describe the general location of molar canals but do not emphasize the need for directional file entry based on individual root morphology.(2,3) Common clinical failures—ledging, file separation, and canal over-preparation—are often due to improper access angulation rather than lack of anatomical knowledge.(5,6)

Materials and Methodology

Radiographic evaluation primarily demonstrates canal orientation in the buccolingual plane. In certain canals, such as the mesio-buccal canal of mandibular molars (e.g., tooth 46), the angulation may occur predominantly in the mesiodistal direction. Since this deviation lies in the coronal plane, it may not be fully represented in conventional periapical radiographs.

Complex canal angulations described in classical morphology studies by Frank Vertucci are often difficult to appreciate fully in conventional radiographs.

The proposed technique is based on over 20 years of clinical practice. Tooth access is minimally invasive, often using a rectangular opening. (7) After initial penetration with a round bur, the practitioner changes to a fissure bur to refine the shape. Files are then inserted at calculated angles based on occlusal landmarks.(3)

Sample size: 30

Number of teeth studied: 30

How angles were measured: Using a protractor on long axis of tooth

Results

Mandibular Molars (36,37,46,47)

Buccal View

MB canal is at 5-10° angulation (Figure 1a)

DB canal is at 3-5° angulation (Figure 1b)
ML canal is almost vertical or <5° buccal angulation (Figure 1c)

DL canal is at 5-10° angulation but after insertion it decreases to 2-3° (Figure 1d)

Figure 1a

Figure 1b

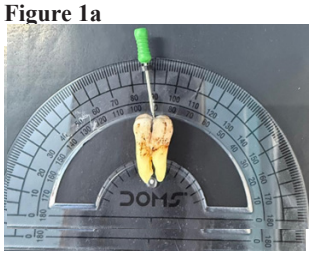


Figure 1c

Figure 1d

2. Maxillary Molars (16,17,26,27)

- Maxillary molars often require diagonal file entry; canals may form an X pattern.

- This method requires no magnification or expensive tools—only precise angulation and experience.

Mesial view

Palatal canal is at 8-10° angulation (Figure 2a)

DB canal is at 3-5° angulation (Figure 2b)

MB canal is at 1-2° angulation (Figure 2c)

Figure 2a

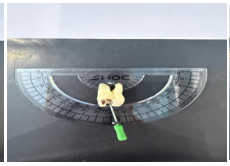


Figure 2b

Figure 2c

Buccal view

Palatal canal is at 1-2° angulation (Figure 2d)

MB canal is at 1-2° angulation (Figure 2e)

DB canal is at 5-7° angulation (Figure 2f)

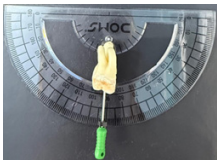


Figure 2d

Figure 2e

Figure 2f

Radiographic and Anatomical Validation

X-rays taken from mesiodistal (MD) plane and buccolingual (BL) plane show the true file trajectories.(9) Clinical sketches align well with extracted tooth anatomy.(3) The technique's access angles were confirmed using both radiographs and clinical diagrams.

The Scientific Explanation

A standard periapical radiograph mainly represents the buccolingual–sagittal plane of the tooth.

Therefore:

Canal angulation occurring in the sagittal plane (buccolingual direction) can be seen on the radiograph.

Canal angulation occurring in the coronal plane (mesiodistal direction) may not be visible.

Most clinicians use angulation intuitively but never document it.

Distal canals of mandibular molars often show visible angulation on X-rays.

Mesio-buccal canals may not show their full angulation radiographically.

Discussion

Successful endodontic treatment depends on accurate identification and negotiation of root canals. While the anatomical position of molar canals has been well documented in the literature, practical guidance on the direction of file insertion during canal location is limited. In many clinical situations, dentists rely primarily on radiographic interpretation and textbook descriptions of canal position. However, conventional periapical radiographs provide only a two-dimensional representation of a three-dimensional anatomical structure, which may obscure the true direction of canal curvature.

For example, in mandibular molars such as tooth 46, the mesio-buccal canal may exhibit angulation predominantly in the mesiodistal direction. Since this deviation occurs in the coronal plane, it may not be clearly visible on radiographs that mainly depict structures in the buccolingual plane. As a result, clinicians may attempt to negotiate the canal in an incorrect direction, increasing the risk of procedural errors such as ledge formation or perforation.(5,6)

Most clinicians use angulation intuitively but never document it. This paper formalizes the process. When access angles are not respected, files resist entry, increasing the chance of procedural errors.(5,6) Beginners benefit most, as this approach acts as a 3D map guiding safe entry paths. It also works seamlessly with endomotors and traditional hand files.(10)

A limitation of this study is the relatively small sample size and the absence of CBCT-based validation, which has been recommended in recent endodontic research for anatomical accuracy [11].

Conclusion

This technique offers a reproducible method to simplify canal access using root-oriented angulation. It is especially helpful for young dentists and general practitioners. The method minimizes procedural complications like perforations and improves accuracy in canal negotiation.(5) Future studies may refine this approach with CBCT or digital navigation systems.(11)

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