

MINIMUM FOR MAXIMUM - Newer Trends in Endodontic Access Preparation: A Review

Sundus Ansari, Deepika Mod, Nidhi Malde, Vikram Shetty

Department Of Conservative Dentistry And Endodontics College Of Dental Sciences And Hospital, Amargadh, Bhavnagar, Gujarat, India.

Abstract

Access cavity preparation is of paramount importance as it is the vital stage that governs the success or ease of the ongoing treatment. Access not only precedes all other maneuvers, it determines their likelihood of success. Traditionally, each type of tooth has corresponded to a particular access shape. They focus on removing tooth structure to allow straight- line entry which predispose previously treated teeth to fracture via increased removal of tooth structure.

To overcome these, newer approaches have been made which employ more flexible instruments, new materials and techniques to preserve more tooth structure with focus placed on saving PCD which improves force distribution and covers fracture susceptibility.

Keywords: Pericervical dentin, Access, Modern endodontics, Molar.

INTRODUCTION

There has been a paradigm shift in this modern era of endodontics from conventional to conservative to ultraconservative access preparation with the availability of more flexible rotary instruments with enhanced magnification. The conventional access is invasive and compromises the tooth structure. Therefore, its application is becoming questionable. The ultimate goal of modern access is to yield more strength to the tooth and confining the access size to the natural dimensions of the pulp chamber.

The access cavity preparations depends on three main factors (Figure 1):-

1. Restorative needs.

2. Tooth needs.
3. Operator needs.



Fig-1 Factors for access cavity preparation

Traditional access only focusses on operator needs which resulted in failures as the other factors were compromised. Newer access balances these three factors and

primarily aims to preserve pericervical dentin [PCD] to, reinforces the root canal treated teeth.

The reason for the shift from traditional access to conservative dentin saving access:-

1. Failure of endodontic monoblock to reinforce the endodontically treated teeth³.
2. Intracoronal composite failed to strengthen the tooth³.
3. Placement of posts did not benefit molars³.
4. Many stress tests has proven the crack initiation in endodontically treated root³.

Hence, for the long term biological and functional integrity of root canal treated teeth there is a need to shift our focus to conservative access preparation.

WHY AND WHEN ENDODONTICALLY TREATED TEETH FAIL UNDER FUNCTION?

The etiology behind this is simply stated as:-

1. Degree of stress experienced by the tooth under load ².
2. Inherent biomechanical properties of the remaining structure responsible for resisting fracture ².

To prevent fracture rates the following attempts are made:-

1. Preservation of Pericervical dentin [PCD].
2. 3D Ferrule.
3. 3D Soffit.

Preservation of Pericervical dentin [PCD].

The dentin surrounding the alveolar crest often regarded as the “ irreplaceable critical most zone”.² No man- made material can replace the original tissues if compromised. It is roughly 4mm above and 4mm below to the crestal bone. In order to prevent fracture, preserve the ferrule it is of utmost importance to preserve PCD as it is directly proportional to the survival rate of tooth (Figure 2).

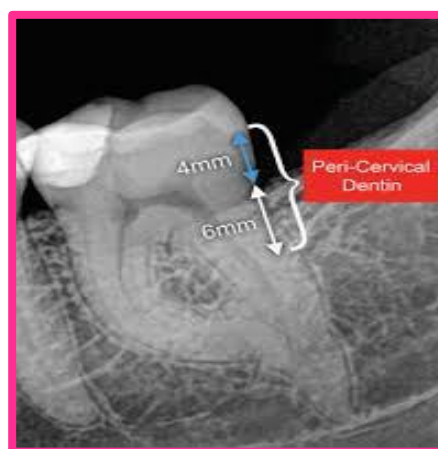


Fig- 2 Pericervical dentin [PCD].

3D Ferrule.

Axial wall of dentin covered by axial wall of the crown ².

1. 3D stands for 3 components of ferrule:-
2. Vertical component- 1.5 – 2.5mm.
Dentin thickness [girth]- 1-2mm (Figure 3).

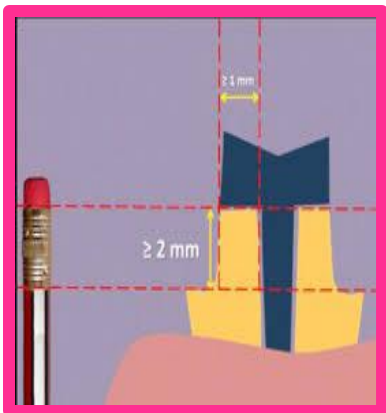


Fig 3: Three components of ferrule

3. Total occlusal convergence/ net taper-total draw of 2 opposing axial walls to receive a fixed crown which is 10 deg in 3mm of vertical ferrule, 20 deg in whereas newer porcelain crown demands 50deg or more taper owing to its deep chamfer marginal zones².

3D Soffit.

In architecture, soffit is described as underside feature of ceiling, the corner of the ceiling and wall but in dentistry it is 360 deg stepped access². Maintain a small border amount of the chamber roof, near the point where it curves 90deg and becomes the wall. These 360deg soffit is a perfect example of banked tooth structure (Figure 4).



Fig 4: 360 deg soffit/ banking

Attempts to remove soffit which is a small piece of roof around the entire coronal portion of pulp chamber may also damage the surrounding PCD. This approach of banking tooth structure aids in long- term retention and fracture resistance of tooth.⁸

NEWER ACCESS PREPARATION DESIGNS

The aim of conservative access preparation can be redefined from “removal of as little tooth structure as possible” to “removal of as little as necessary”.⁸ The newer access focusses on dentin preservation with the aid of the newer advancements in magnification armamentarium are:-

1. Ninja endodontic access cavity.
2. Orifice- directed dentin conservation access cavity.
3. Cali Lilly enamel preparation.
4. Caries derived access cavity.
5. Image Guided endodontic access.
6. Dynamic guided access.
7. Micro guided endodontic access.

1. **NINJA ENDODONTIC ACCESS CAVITY** : It is ultra conservative access cavity preparation. In this oblique projection is towards central fossa of root orifice in occlusal plane. The root canal orifice can be visualized from varying degree of visual angulation. This access cavity preparation gives better fracture resistance (Figure 5).

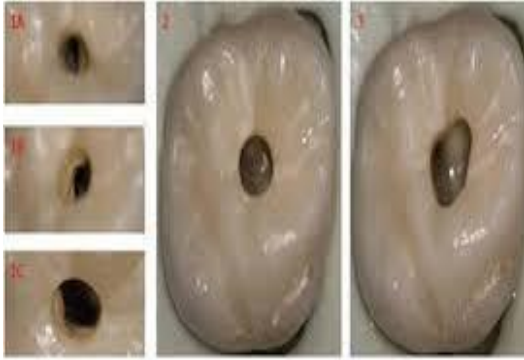


Fig 5: Ninja endodontic access cavity

2. **ORIFICE GUIDED/ DENTIN CONSERVATION ACCESS CAVITY:** Aim of this type of preparation is to conserve dentin. In this dentin truss is left after access cavity preparation. Two separate cavities are prepared for this access cavity preparation for maxillary and mandibular teeth (Figure 6, 7, and 8).



Fig 6: Access cavity preparation

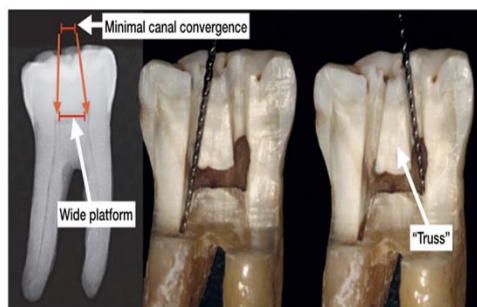


Fig 7: access cavity preparation



Fig 8: Truss conservation access cavity

3. **CALA LILY ENAMEL PREPARATION:** Due to unfavorable C- factor and unsupported enamel rods are present, while removing old restorations or during conventional access cavity preparation. The enamel is cut back at 45° with ala lily shape in this access cavity preparation (Figure 9, 10 and 11).



Fig 9: Shows 45° enamel cut



Fig 10: Calalily flower



Fig 11: Cala lily shape access cavity preparation

4. **CARIES DERIVED ACCESS :**

According to this concept described by Clark and Khademi, low or zero value tooth or restorative structures i.e., existing restorative materials, decay and less strategic tooth structure are removed for access preparation. This access design thus allows for direct conservation of healthy dentin by removing discontinuities in tooth structure.⁸

5. **IMAGE GUIDED ENDODONTICS :**

In this various different imaging techniques are used TO determine and locate access cavity. Thus conservation of dentin is possible in this technique (Figure 12).

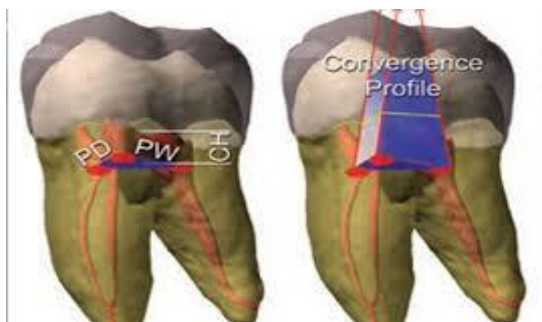


Fig 12: Image guided access cavity preparation

6. **DYNAMIC GUIDED ACCESS**

CAVITY : Introduced by Dr. Charles M. in this CBCT imaging technique is used to plan out conservative access cavity preparation. It gives 3 dimensional imaging view (Figure 13).

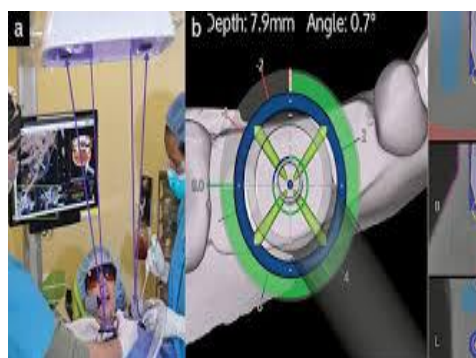


Fig 13: Dynamic guided access cavity preparation

7. **MICRO GUIDED ENDODONTIC**

ACCESS: In this CBCT, surface scanner and software allows the virtual guidance for ideal access opening. A 3 D template is made and used for conservative approach for access opening of even calcified root canals .

Difference In Traditional And Newer Concepts

It follows 'extension for prevention' concept.	It follows 'prevention of extension' concept.
During cavity preparation, centre of pulp chamber should be the target of the initial penetration, at a point where the roof and floor of the pulp chamber are at the widest.	During cavity preparation, only tooth structure required to be removed is prepared and the access is made as conservative as possible.
Widening of access cavity prevents any iatrogenic possibilities.	During access preparation, lack of clinical judgement may lead to iatrogenic complication.
No preservation of PCD.	Preservation of PCD.
Attempted for all teeth.	Cannot be attempted for all teeth.
No possibility of pulp tissue remnants.	Possibility of endodontic failure, mishaps- if shaping and cleaning protocol is not followed.
It follows 'extension for prevention' concept.	It follows 'prevention of extension' concept.

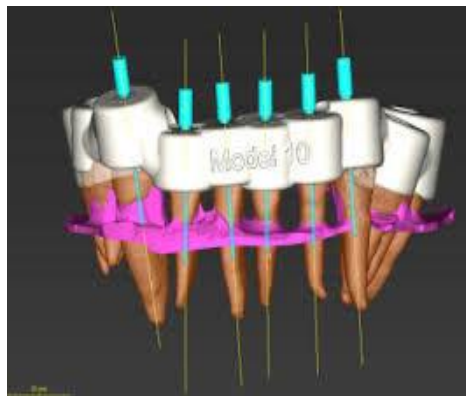
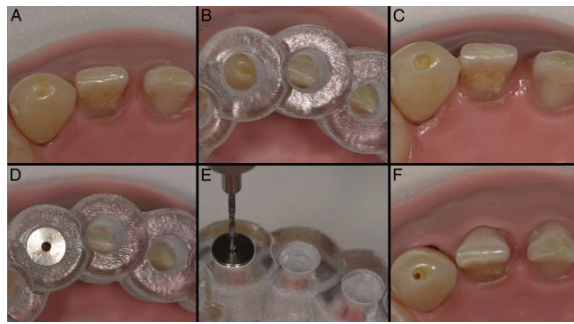


Fig 14: Micro guided access cavity preparation.

Conclusion

Focusing on too much of minimal technique may lead to a higher rate of procedural errors and benefit may be outweighed by poor clinical outcome. Hence, the clinician should strike the right balance between minimal preparation and traditional endodontic preparation with their own pros and cons, thus achieving the objectives of endodontic treatment.

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Finance/ Sponsorship

None.

Conflict of Interest

No conflict of interest.

Corresponding Author:

Dr. Sundus Ansari
Department of conservative dentistry and endodontics, college of dental sciences and hospital, amargadh, Bhavnagar, Gujarat, india.

Email ID: sunduschohan1993@gmail.com