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Conservative endodontics: A truss access case series

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Abstract
The prime objective of this case report is to obtain access cavity designs that is strategic dentin preservation (ie, leaving a truss of dentin between the 2 cavities thus prepared). Three permanent teeth with an indication for endodontic treatment were treated via the truss access cavity design rather than traditional access cavity protocol using copious irrigation. The teeth were then given post-endodontic restorations. Endodontically treated teeth did not show any post-operative symptoms or any presence of post-operative periapical radiolucency or flare-up. Truss access approach mainly emphasizes on the preservation of the healthy tooth structure with the minimally invasive approach. This minimal invasive approach in access opening avoids the need for conventionally placed crowns.

Keywords: Access cavity, truss access, conservative access cavities

Introduction
Endodontic therapy is comprised of three factors which are cleaning and shaping, disinfection and three-dimensional obturation of the root canal system. However, access cavity preparation is known to be one of the most challenging and an important step for a successful endodontic treatment [1].

Weakening of tooth structure is a major drawback in Traditional Endodontic Access Cavity (TEC) mainly due to pathology. For restoration of these teeth, various treatment modalities may be used, ranging from a simple direct restoration with or without a post and core to more complex indirect restorations, including inlay, onlay and full-coverage crowns [2].

TEC has been shown to demonstrate a significantly higher percentage of non-restorable fractures of teeth which was reasoned to be related to the higher volume of coronal tooth structure loss in TEC [3].

To overcome this, Clark and Khademi modified the endodontic access cavity design to minimize the tooth structure removal and this was known as the Conservative Endodontic access Cavity (CEC). The aim of the CEC was to preserve some of the chamber roof and the pericervical dentin [4].

The pericervical dentin is the dentin that is located 4 mm above and 4 mm below the crestal bone and they serve in distribution of functional stresses in teeth. Thus, it is necessary that we preserve this pericervical dentin in order to maintain the biomechanical response of the radicular dentin [5].

Trials of more conservative access cavity designs such as contracted (a small conservative cavity on the occlusal surface that allow the clinician to access all the canal orifices), truss (a direct access from the occlusal surface to expose the mesial and distal canal orifices and leaving the intervening dentin intact), and ninja (ultraconservative approach) access cavity preparation methods have been previously reported to improve fracture resistance of endodontically treated teeth and reduce the dependency on complex, more expensive post endodontic restorations [6]. The differences between traditional access cavity and contracted access cavity is mentioned in Table 1.

One approach of CEC is the orifice-directed design (also called the ‘‘truss’’ access cavity), in which separate cavities are prepared to approach the mesial and distal canal systems in a mandibular molar, whereas for maxillary molars the mesio- and distobuccal canals are approached through one cavity and the palatal canal through another [6].

The prime objective of these access cavity designs is strategic dentin preservation (ie, leaving a truss of dentin between the 2 cavities thus prepared).

Case report(s)

Case 1

A 27-year-old female patient came to the dental clinic with dull spontaneous pain in the right lower back tooth region. Intraoral examination revealed disto-proximal caries of the right lower first molar (FDI no. 36). Tooth was tender to percussion and there was absence of sinus tract or extra-oral swelling. Pulp Sensibility test gave a positive response. Radiographic examination showed disto-proximal radiolucency involving enamel, dentin, and pulp with periapical widening suggestive of chronic irreversible pulpitis. [Fig 1]

Fig 1: Pre-operative

Coronal access

After delivering of local anesthesia excavation of caries was performed using a small round bur (Mani Inc. bur size no #2) after which pre-endodontic build-up was performed. Tooth was isolated using a rubber dam. Coronal access was made out just exactly above the mesial pulpal horn and the access to pulp chamber was gained from occlusal surface to roof of the pulp chamber by orienting the bur parallel to the long axis of the tooth in oval shape buccolingually with a small round bur (Mani Inc. bur size no #2). The mesiobuccal and mesiolingual orifices were conformed using a DG-16 probe Then, the bur was placed over the distal pulpal horn and the access to the pulp chamber was gained. De-roofing above the canal orifices was done using safe ended diamond bur (Mani Inc.) (Fig 2)

Fig 2: Truss access cavity

Shaping and Cleaning

Apical Patency was established with a pre-curved, K-file size #10 (Dentsply/ Maillefer) using a watch-winding motion until it reaches the root apex. Pulp extirpation was done till size 15 stainless steel hand file. After which, the working lengths of the root canals were determined with size 15 stainless steel hand file and a Root ZxII electronic apex locator (J. Morita and Co, Tustin, CA, USA. Glide path was made using proglider rotatory file (Dentsply Maillefer, Ballaigues, Switzerland). (Fig 3) After establishing glide path shaping of the canals were performed using crown-down technique with ProTaper gold rotary system (Dentsply Maillefer, Ballaigues, Switzerland). Final irrigant i.e 17% EDTA was activated prior to obturation using Endo activator sonic activation.

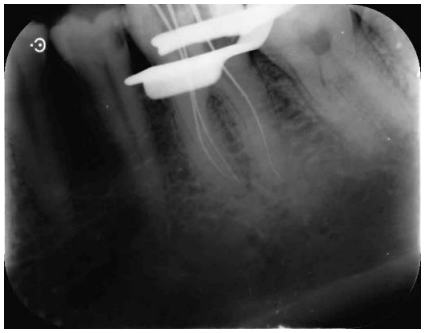

Fig 3: Working length radiograph

Obturation and post endodontic restoration

The canals were dried with absorbent paper points (Dia Dent). A master gutta-percha point of F2 0.6 taper of length 18 mm was placed and master cone radiograph was taken [Fig 4]. Then, the Ca $(OH)_2$ based root canal sealer (Kerr Sybron endo) was prepared according to the manufacturer's instruction and inserted into the root canal together with the gutta-percha point to the working length.

The gutta-percha was then sheared off at the canal orifice and then bulk-fill nanohybrid composite restoration was used for post-endodontic restoration and radiograph was taken to visualize adequate packing of the restorative material. [Fig 5]

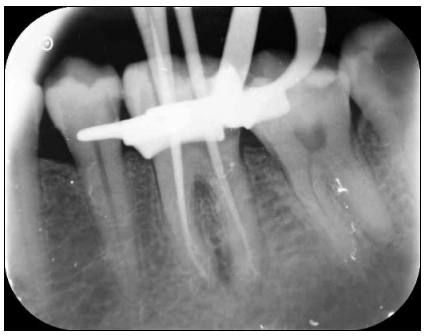

Fig 4: Master cone radiograph

Fig 5: Post-obturation

Case 2

A 46-year-old female patient came to the dental clinic with dull spontaneous pain in the upper right back tooth region. Intraoral examination revealed disto-proximal caries of the upper right first premolar (FDI no. 14). Percussion test showed a positive result. There was absence of sinus tract and any extra-oral swelling. Pulp Sensibility test gave a negative response. Radiographic examination showed radiolucency disto-proximal radiolucency involving enamel, dentin, and pulp with periapical widening suggestive of apical

periodontitis. [Fig 6]

Fig 6: Pre-operative

Coronal access

After delivering of local anesthesia caries around the disto-proximal marginal ridge was excavated with a small round bur (Mani Inc.bur size no #2) after which pre-endodontic build-up was performed. Isolation was done using a rubber dam. After isolation coronal access was made out just exactly above the buccal pulpal horn. The access to pulp chamber was gained from occlusal surface to roof of the pulp chamber by orienting the bur parallel to the long axis of the tooth in oval shape buccolingually with a small round bur (Mani Inc. bur size no #2). The buccal were conformed using a DG-16 probe Then, the bur was placed over the palatal pulpal horn and the access to the pulp chamber is gained. (Fig 7)

Fig 7: Truss access cavity

Shaping and Cleaning

Multiple visit endodontic treatment was recommended for the patient. In the first visit, apical Patency was established with a pre-curved, K-file size #10 (Dentsply/ Maillefer) using a watch-winding motion until it reaches the root apex. The working lengths of the root canals were determined with size 15 stainless steel hand files and a Root ZxII electronic apex locator (J. Morita and Co, Tustin, CA, USA. Glide path was made using proglider rotatory file (Dentsply Maillefer, Ballaigues, Switzerland). (Fig 8) After establishing glide path shaping of the canals were performed using crown-down technique with ProTaper gold rotary system (Dentsply Maillefer, Ballaigues, Switzerland). Water-based calcium hydroxide dressing was given and patient was recalled after 7 days.

In the next visit, the residual calcium hydroxide was removed using passive ultrasonic activation of 17% EDTA. The canals were then ready for obturation.

Fig 8: Working length determination

Obturation and post endodontic restoration

The canals were dried with absorbent paper points (DiaDent) similar to the master apical file size. A master gutta-percha point of F3 0.6 taper of length 18 mm was placed and master cone radiograph was taken [Fig 9]. Then, the $Ca(OH)_2$ based root canal sealer (Kerr Sybron endo) was prepared according to the manufacturer's instruction and inserted into the root canal together with the gutta-percha point to the working length.

The gutta-percha was then sheared off at the canal orifice and then bulk-fill nanohybrid composite restoration was used for post-endodontic restoration and radiograph was taken to visualize adequate packing of the restorative material. [Fig 10]

Fig 9: Master cone selection

Fig 10: Post obturation

Case 3

A 30-year-old female patient was referred to a dental clinic with dull spontaneous pain in the left lower back tooth region. Intraoral examination revealed disto-proximal caries of the lower right first molar (FDI no. 46). Tooth was tender on percussion and there was absence of any sinus tract and extra-

oral swelling. Pulp Sensibility test gave a positive response. Radiographic examination showed radiolucency disto-proximal radiolucency involving enamel, dentin, and pulp suggestive of chronic irreversible pulpitis. [Fig 11]

Fig 11: Pre-operative

Coronal access

After delivering of local anesthesia caries around the disto-proximal marginal rigde was excavated with a small round bur (Mani Inc.bur size no #2) after which pre-endodontic build-up was performed. Isolation was done using a rubber dam. After isolation coronal access was made out just exactly above the mesial pulpal horn. The access to pulp chamber was gained from occlusal surface to roof of the pulp chamber by orienting the bur parallel to the long axis of the tooth in oval shape buccolingually with a small round bur (Mani Inc. bur size no #2). The mesiobuccal and mesiolingual orifices were conformed using a DG-16 probe. Then, the bur was placed over the distal pulpal horn and the access to the pulp chamber is gained. Distobuccal and distolingual orifices were conformed using a DG-16 probe. De-roofing above the canal orifices was done using safe ended diamond bur (Mani Inc.) (Fig 12).

Fig 12: Truss access cavity

Shaping and Cleaning

Apical Patency was established with a pre-curved, K-file size #10 (Dentsply/ Maillefer) using a watch-winding motion until it reaches the root apex. The working lengths of the root canals were determined with size 15 stainless steel hand files and a Root ZxII electronic apex locator (J. Morita and Co, Tustin, CA, USA. Glide path was made using proglider rotatory file (Dentsply Maillefer, Ballaigues, Switzerland). (Fig 13) After establishing glide path shaping of the canals were performed using crown-down technique with ProTaper gold rotary system (Dentsply Maillefer, Ballaigues, Switzerland). Final irrigant i.e 17% EDTA was activated prior to obturation using Passive ultrasonic activation.

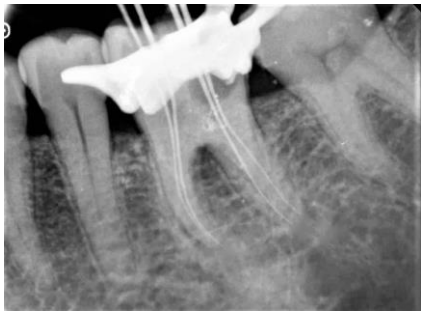

Fig 13: Working length determination

Obturation and Post endodontic Restoration

The canals were dried with absorbent paper points (DiaDent) similar to master apical file. A master gutta-percha point of F2 0.6 taper of length 18 mm was placed and master cone radiograph was taken [Fig 14]. Then, the $Ca(OH)_2$ based root canal sealer (Kerr Sybron Endo) was prepared according to the manufacturer's instruction and inserted into the root canal together with the gutta-percha point to the working length.

The gutta-percha was then sheared off at the canal orifice and then bulk-fill nanohybrid composite restoration was used for post-endodontic restoration and radiograph was taken to visualize adequate packing of the restorative material. [Fig 15]

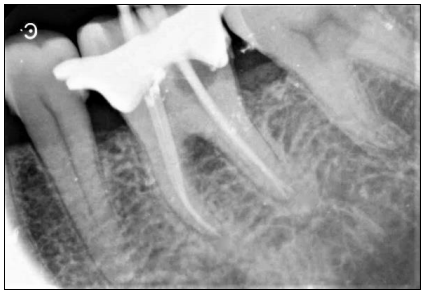

Fig 14: Master cone selection

Fig 15: Post-obturation radiograph

Discussion

One of the most important factors in conservative endodontic treatment is the conservation of tooth structure which affects the survival of endodontically treated teeth. The benefits and possible drawbacks of the conservative endodontic access cavity concept have not been well supported by research data.

Root canal treatment mainly relies on complete cleaning and disinfection of root canals and filling it biologically compatible materials [7].

The access cavity preparation depends on the G.V. Black's principles. 'Extension for prevention,' is the major concept

that has been followed universally for many decades. A little modification of the principles and they include the outline form, the convenience form, removal of the carious dentin and the toilet of the cavity. Underlying these principles is Black's concept of 'extension for prevention', which promotes the sacrifice of additional tooth structure to prevent iatrogenic complications and to best achieve the ultimate goals.

To overcome the problem of preservation of tooth structure especially pericervical dentin, different conservative access cavity designs came into existence [8].

There are different paradigms within the realm of conservative access cavity (conservative endodontic access, ultraconservative ''ninja'' access, and orifice-directed ''truss'' access), and no ''definitions'' exist for each of these designs at this time [9].

However, a major drawback is that there is lack of evidence to support the use of truss access cavity preparation which can be used as a alternative method to Traditional access cavities on a daily basis [10].

In a study conducted by Corsentino *et al.* concluded that TRECs do not increase the fracture strength of endodontically treated teeth in comparison with CECs and TECs. Moreover, the loss of mesial and distal ridges reduced the fracture strength of teeth significantly [11].

This is the first known case series where Truss access was used and the first case report where Truss access was used on maxillary premolars [12].

Clinically, mandibular first molars are usually considered in Truss access because these teeth are more susceptible to fracture (with wider occlusal tables, which increase the occlusal stresses). These teeth are also the most commonly endodontically treated posterior teeth and often require cuspal protection. Also, the approach of creating a Truss access was performed according to the diagrammatic representation which was used in a study performed by Neelakattan *et al*. [13]

According to Plotino *et al.*, Teeth with TEC access showed lower fracture strength than the ones prepared with CEC or NEC. Ultraconservative "ninja" endodontic cavity access did not increase the fracture strength of teeth compared with the ones prepared with CEC [14].

One of the major disadvange in Truss access is inaccuracy which may lead to gauging and worst may even lead to perforation. Thus, clinical experience and proper radiographic assessment is necessary while planning a Truss access. There are even chances of improper pulp tissue removal and missed canals [15].

In a study performed by Ozyurk *et al.* CEC preparation did not increase the fracture strength of teeth with class II cavities compared with TEC preparation [16].

Table 1: Comparison between traditional access cavity and conservative access cavity [12]

Traditional access cavity	Conservative access cavity
• It follows the principle of 'Extension for Prevention'	• It follows the concept of 'Prevention of extension'
• During cavity preparation, the centre of the 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 the tooth structure required to be removed is prepared and the access is made as conservative as possible
• Widening of access cavity prevents iatrogenic possibilities during access cavity preparation.	• During access cavity preparation lack of clinical judgement may lead to iatrogenic complications
• No preservation of pericervical dentin	• Preservation of pericervical dentin
• Possibility of Soffit is less probable	• Soffit is prepared during conservative access preparation
• Attempted for all the teeth during Endodontic Treatment	• Cannot be attempted for all teeth during endodontic treatment
• No possibility of pulp tissue remnants.	• Possibility of endodontic failure if shaping and cleaning protocol is not followed

Conclusions

Conservative access endodontics has challenged the traditional conventional approach in the recent years. Truss access approach mainly emphasizes on the preservation of the healthy tooth structure with the minimally invasive approach. This minimal invasive approach in access opening avoids the need for conventionally placed crowns. Researches and clinical evidences of Truss should be performed in endodontics to help conservative access openings to overcome traditional access and changing the paradigm of "Endodontics" to "Conservative Endodontics"

Fig 16: A schematic representation of the (A) TEC access (black dotted line) and (B) Truss access (red dotted line) cavity in a mandibular molar

Conflict of interest

None.

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None

References

1. Lang H, Korkmaz Y, Schneider K, Raab WH. Impact of endodontic treatments on the rigidity of the root. J Dent Res. 2006; 85:364-8.
2. Tang W, Wu Y, Smales RJ. Identifying and reducing

risks for potential fractures in endodontically treated teeth. J Endod. 2010; 36:609-17.
3. Pierrisnard L, Bohin F, Renault P, Barquins M. Corono-radicular reconstruction of pulpless teeth: A mechanical study using finite element analysis. J Prosthet Dent. 2002; 88:442-8.
4. Clark D, Khademi JA. Case studies in modern molar endodontic access and directed dentin conservation. Dent Clin North Am. 2010; 54:275-89.
5. Clark D, Khademi J. Modern molar endodontic access and directed dentin conservation. Dent Clin North Am. 2010; 54:249-73.
6. Clark D, Khademi J, Herbranson E. Fracture resistant endodontic and restorative preparations. Dent Today. 2013; 32:118.
7. Clark D, Khademi J, Herbranson E. The new science of strong endo teeth. Dent Today. 2013; 32:112.
8. Bassir MM, Labibzadeh A, Mollaverdi F. The effect of amount of lost tooth structure and restorative technique on fracture resistance of endodontically treated premolars. J Conserv Dent. 2013; 16:413-7.
9. Krishan R, Paqué F, Ossareh A, Kishen A, Dao T, Friedman S. Impacts of conservative endodontic cavity on root canal instrumentation efficacy and resistance to fracture assessed in incisors, premolars, and molars. J Endod. 2014; 40:1160-6.
10. Moore B, Verdelis K, Kishen A, Dao T, Friedman S. Impacts of contracted endodontic cavities on instrumentation efficacy and biomechanical responses in maxillary molars. J Endod. 2016; 42:1779-83.
11. Corsentino G, Pedullà E, Castelli L, Liguori M, Spicciarelli V, Martignoni M, Ferrari M, Grandini S. Influence of access cavity preparation and remaining tooth substance on fracture strength of endodontically treated teeth. Journal of endodontics. 2018; 44(9):1416-21.
12. Bürklein S, Schäfer E. Minimally invasive endodontics. Quintessence Int. 2015; 46:119-24.
13. Neelakantan P, Khan K, Ng GP, Yip CY, Zhang C, Cheung GS. Does the orifice-directed dentin conservation access design debride pulp chamber and mesial root canal systems of mandibular molars similar to a traditional access design? Journal of endodontics. 2018; 44(2):274-9.
14. Plotino G, Grande NM, Isufi A, Ioppolo P, Pedullà E, Bedini R, Gambarini G, Testarelli L. Fracture strength of endodontically treated teeth with different access cavity designs. Journal of endodontics. 2017; 43(6):995-1000.
15. Abou-Elnaga MY, Alkhawas MB, Kim HC, Refai AS. Effect of Truss Access and Artificial Truss Restoration on the Fracture Resistance of Endodontically Treated Mandibular First Molars. Journal of endodontics. 2019; 45(6):813-7.
16. Özyürek T, Ülker Ö, Demiryürek EÖ, Yılmaz F. The effects of endodontic access cavity preparation design on the fracture strength of Endodontically treated teeth: traditional versus conservative preparation. Journal of endodontics. 2018; 44(5):800-5.