Case Report

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Truss Access Cavity Design: Limitations and Management: A Case Report

Abstract:

Missed root canal is the major cause of failure in endodontic treatment. Recently, conservative access cavity designs are advocated to conserve tooth structure, especially the pericervical dentin. Although several researchers have shown them to have better mechanical and biological features, the techniques have their own limitations. This case report discusses the limitations in success of Truss Access Cavity design and its management. Magnification and 3-D imaging are effective in resolving such limitations when Truss cavity is used for endodontic access.

This case report describes the endodontic management of left mandibular first molar with emphasis on a new conservative approach employed in access opening. A 32-year old male patient suffered with severe sensitivity in attrited left lower first molar. After thorough examination, Truss design for access opening was planned for its endodontic treatment. However, Dentascan done due to post-operative pain revealed a missed canal in the initial treatment. The tooth was then re-treated. Though Truss technique preserved most of the healthy tooth structure, it failed in negotiating all the canals and resulted in failure of root canal treatment.

Key-words: Conservative endodontic access, Orifice-directed access, Endodontic access cavity, Conventional endodontic access, Truss Access.

Introduction:

The main aim of endodontic treatment is to remove all the infectious tissue followed by three dimensional sealing of the root canal. To achieve this, access cavity design focuses on including all the pulp horns and complete de-roofing of the pulp chamber for sufficient debridement of the coronal and radicular portion of the root canal system. The traditional design results in the removal of pericervical dentin that increases the chances of tooth fracture. Hence, newer conservative approaches for gaining access into the pulp chamber are proposed. [1] In these designs, direct penetration to canal orifices is proposed hence complete deroofing of the pulp chamber is avoided. Strength of these conservative cavities is reported to be better. [2] Scientific data on conservative endodontic access cavity designs on removing infections is promising. [3,4] Neelankantan et al., in 2018 reported that root canal debridement of the orifice directed dentin conservation access cavity i.e. Truss Access is

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comparable with traditional access cavity. [4] Truss cavity is one of the most studied and accepted conservative design in literature. [5] In this design, a direct access from occlusal surface to expose the mesial and distal canal orifices is achieved, leaving in-between dentin intact. Thus, separate cavities are prepared to approach the mesial and distal canal systems in a mandibular molar.

As sufficient scientific data supports both mechanical and biological aspect of conservative design, hence, access cavity was prepared according to Truss design in this case report. However the outcome of endodontic treatment resulted in failure which was later on managed using 3-D imaging and magnification. This case report is in accordance with the PRICE 2020 guidelines. It discusses the protocol for endodontic treatment involving Truss as conservative access cavity design.

Case Report:

A 32-year old Indian male patient was referred to Department of Conservative Dentistry and Endodontics with chief complaint of dull spontaneous pain in the left mandibular region. Medical history was non-contributory. Extra-oral examination was unremarkable. Dental history revealed that the patient had restoration 2 years ago in the left mandibular first molar (tooth 36). The patient remained asymptomatic for long time. A week before presentation, the tooth became painful. A complete intra-oral examination was done which included pain on percussion and palpation, mobility and periodontal pocket probing depth. This revealed mesio-occlusal restoration in tooth 36 (Figure1). There were no periodontal pockets and sinus tract in relation to 36. The tooth was mobile within physiological limits. The tooth was painful upon vertical percussion. On cold testing, tooth 36 gave a delayed positive response. The pre-operative radiographic evaluation (Digora) using settings (0.2s exposure time, 70kVp and 7 mA) revealed mesio-occlusal radio-opacity of restoration involving enamel, dentin and pulp with periapical widening (Figure 2) suggestive of acute irreversible pulpits with acute apical periodontitis. With the trending minimally invasive approach, Truss access cavity preparation was planned in this case.

Truss cavity preparation for coronal access:

The patient was delivered local anaesthesia (Xicaine, ICPA Health Products Ltd., Sabarkantha). Truss access was performed. In this, coronal access was made 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 explored using a DG-16 probe (Dentsply Maillefer). The bur was then placed over the distal pulp horn and on access negotiated two distal canal orifices - Distobuccal and Distolingual. De-roofing above the canal orifices was done using Endo Z carbide bur (Dentsply Maillefer). In between distal and mesial cavities the intervening distance of 2mm (Truss) was preserved (Figure 3, 4).

Biomechanical preparation of root canal:

Apical Patency was established with a pre-curved, K-file size #10 (Dentsply Maillefer) using watch-winding motion. The working length of the root canals was determined with size 15 hand file and confirmed with an electronic apex locator (Coltene Whaledent Pvt. Ltd.). After establishing working length, shaping of the canals was performed using crown-down technique with Pro Taper Gold Rotary Files (Dentsply Malliefer). Apical preparation was completed till F2. Irrigation was done with 5.25% Sodium hypochlorite (Hyposol, PREVEST Den Pro) and normal saline. Activation of irrigant was done using Endoactivator (Dentsply) followed by 2% Chlorhexidine gluconate (HexaChlor, SafeEndo) as final irrigant.

Root canal obturation :

The canals were dried with absorbent paper points (DiaDent) followed by single cone obturation (DiaDent) using AH Plus sealer (Dentsply). Final radiograph was taken to check quality of obturation. The gutta percha was sheared off at orifice level. IRM (Dentsply) was placed and patient was recalled after a week for post endodontic restoration (Figure 5).

Follow-up :

On recall appointment, patient reported with pain corresponding to the root canal treated tooth. On clinical examination, pain on percussion was noted. To our surprise, response to cold test was still delayed positive. Tooth was de obturated and 3D imaging (Spiral CT) was done.

Axial sections revealed distal root with three root canals exiting through two apical foramina. The canals initially negotiated were actually middle distal and distolingual. The distobuccal canal was missed (Figure 6). As distobuccal canal was left untreated, toxins from it were exiting in periapical

area. The access cavity was then modified under Dental operating microscope at 20 X magnification to negotiate the missed distobuccal canal (Figure 7). After the preparation and disinfection of distobuccal canal, the tooth was re-obturated. The patient was asymptomatic on recall appointment. Post endodontic restoration was then done (Figure 8).

Among various modern conservative endodontic access cavity designs, the orifice-directed design, also called "Truss" access cavity, is the most studied. Several authors have perpetuated this concept on both clinical and mechanical aspects. [5,6]

The primary and important objective of Truss access cavity design is strategic dentin preservation i.e., leaving a truss of dentin between the two cavities thus prepared. [4] In this case, Truss region of tooth was intact preoperatively as the tooth structure was intact from the centre half to distal marginal ridge. (Figure 1) As mandibular molars are more susceptible to fracture, hence, Truss access cavity design was attempted to preserve the pericervical dentin. Complete deroofing of the pulp chamber was not required.

One of the major disadvantages of conservative design is limited visibility of pulp chamber which may lead to missed canal, perforation or gauging. In this case, reaccess into the pulp chamber was done under high magnification using Dental Operating Microscope (Zeiss Meditec; Dublin, CA) for superior vision and options in magnification and coaxial lighting.

Three dimensional imaging was also not done initially considering unnecessary radiation exposure. Only two distal canals were located in the first attempt. When pain persisted, 3D imaging done demonstrated the presence of three distal canals. The missed distobuccal canal that was exiting through a separate foramen resulted in post-operative pain.

According to this case report, for the success of conservative access design, three dimensional morphology of pulp space must be evaluated preoperatively. This prevents the chances of missing canals and proper negotiation of canal morphology in minimal access opening. Also, it should be ensured that the endodontic treatment is performed under magnification.

There are various case reports mentioning the success of truss access cavity preparation [6]. This is the first known case report where limitation of truss cavity is discussed. Although 3D imaging introduces an amount of radiation, it is the most reliable method.

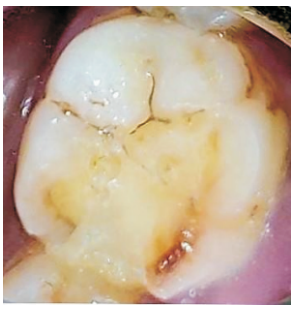

Figure 1. Pre-operative clinical image.

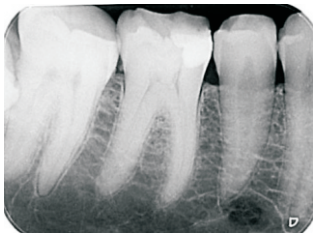

Figure 2. Pre-operative radiogragh

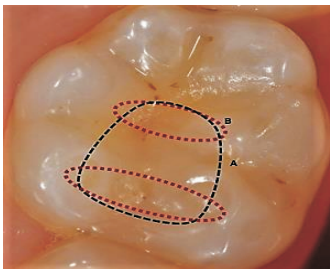

Figure 3. Diagrammatic representation of Truss Access Cavity Design.

Figure 4. Pulp chamber after Truss access preparation (depicting two mesial canals and two distal canals).

Figure 5. Initial post-obturation radiograph.

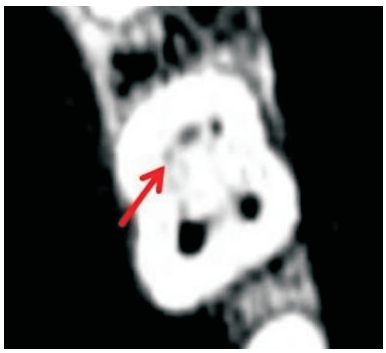

Figure 6. Missed distobuccal canal (red arrow).

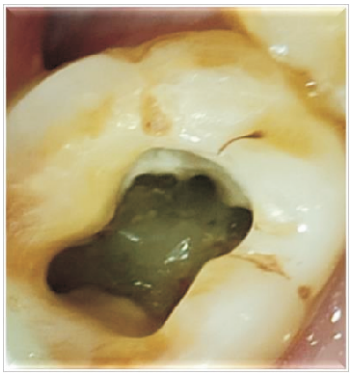

Figure 7. Distobuccal, Middle distal and Distolingual canal orifices after preparation under DOM.

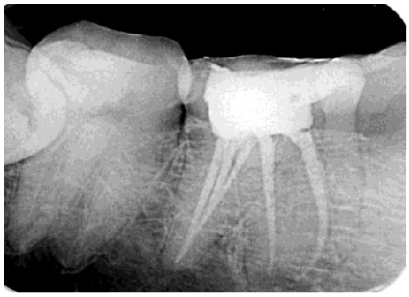

Figure 8. Post-obturation radiograph.

Conclusion

Truss access design is successful conservative approach for gaining endodontic access into the pulp chamber. But, endodontic treatment involving Truss design is successful when 3D imaging and magnification are also used.

We/Authors declare that there is no financial interest or any conflict of interest in this study.

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