

Guided Endodontics: A New Pathway To Apex In Calcified Pulp Canal- A Case Report

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Abstract:

Pulp canal calcifications are one of the most commonly observed situations in day to day life endodontics. Most common reasons for these calcifications can be either trauma, chronic caries, pulpal responses to the various restorative procedures etc. These calcifications pose difficulties for negotiation of the apical foramen which can be successfully achieved by newer advancements in endodontics such as Guided endodontics. This is a case presentation of Guided endodontics done in the Department of Conservative Dentistry and Endodontics of Meghna Institute of Dental Sciences, Nizamabad. A patient with symptomatic apical periodontitis with obliterated canal space in retina to 11 came to the department. The apical foramen was negotiated with the help of Guided Endodontics with CBCT and using guided slots. Obturation was done by gutta-percha and zinc oxide eugenol.

Key words: Guided Endodontics, Pulp Canal Calcifications, Pulpal Obliteration.

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I. Introduction:

Pulp canal calcification (PCC), also termed as canal metamorphosis or pulp canal obliteration is characterized by the deposition of calcified tissue along the walls of the root canal. This results in partial or complete obliteration of the root canal space. The most common causes of PCC are luxation injuries after dental trauma, pulpal response to injuries such as invasive pulp therapy procedures, extended carious lesions, abfractions and restorations¹.

Holcomb and Gregory reported that about 4% incidence of partial or total obliteration of root canal space is seen in anterior teeth in service man. this percentage was increased to about 22% in traumatized permanent teeth². In PCC cases, pulp necrosis was noted in about 1%-16.5% cases and apical periodontitis developed in about 7.3%-24% cases after 4 years of trauma. Most of the experienced clinicians can encounter difficulties for doing a successful endodontic treatment for such cases¹.

The American association of endodontics has classified treatment of calcified root canals and has included them in the category of procedures with high level of difficulty. Routinely long necked cutters and ultrasonic inserts are used but they are still at the edge of treatment failure even if viewed in operating microscope. Apicectomy also usually fails in such cases as localization of the obliterated canal and adequate cleaning of the region contaminated after rot resection is challenging^{3,4}.

In this perspective, the Tridimensional image is an extremely useful tool that gives us new ray of diagnosis and possibilities for performing dental procedures. Clinical situations where CBCT can be performed were defined by American association of endodontists and American association of oral and maxillofacial radiology in the year 2015. One of the indication among the usage of CBCT is the localization of calcified root canal prototype access guides which are generated by means of superimposition of CBCT and intra-buccal or bench scanning images are used precisely for directing the pathway that a bur can run through the calcified

canals^{1,5,6,7}. This minimally invasive technique was termed as Guided Endodontics (Krastl et al., 2016; Zehnder et al., 2016)⁸.

This report aimed to describe a case of guided endodontics programmed with conventional palatal access in maxillary central incisor and to discuss the applicability of this approach in cases of PCC with apical periodontitis and acute symptoms.

Case report:

A 32 year old male patient was reported to the Department Of Conservative Dentistry And Endodontics in the Meghna Institute of Dental Science with a chief complaint of dull throbbing pain in the maxillary central incisor, 11 for the past 15 days. Patient gives a history of previously initiated root canal treatment. On intra oral examination, Fig:1, the tooth presented tender on percussion and access cavity was already initiated. On radiographic examination ,Fig:2,access cavity was initiated and there was a completely obliterated pulp canal space. Patient was symptomatic and it was diagnosed as Pulpal Necrosis with Symptomatic Apical Periodontitis.



Fig 1: Intra-oral examination



Fig 2: Radiographic examination

Patient was advised to take a CBCT with high resolution and a limited field of view. CBCT images confirmed the presence of severely calcified pulp canal in tooth number 11 upto the middle third of the canal. CBCT images also confirmed the root canal space in the apical third of the root. After analysis and discussion with the patient, guided endodontics was chosen as the most appropriate treatment for the present case due to complexity in the case.

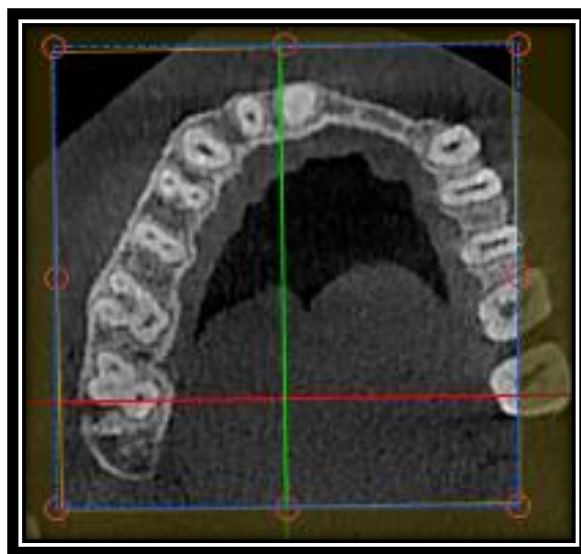


Fig 3 : Pre-op CBCT showing calcification of canal

Armamentarium used for the present case were micromotor, LN Burs, 3D printed guide, rubber-dam, C+ files, K files (Mani) , RVG, diagnostic instruments, EDTA irrigating ,obturing materials.. After obtaining CBCT

, its sent to lab for STL format. A 3D template ,Fig 4,was built taking into account the traditional palatal access. The scans were aligned and processed, so that bur could gain access to the apical visible root canal ,Fig 5.

After checking the adjustment of the template, access was made with a low speed handpiece set at 10,000 rpm . Care was taken to irrigate the drilling action with saline and to avoid microcracks. Intraoperative radiographs were taken frequently to check the correct bur position . The patent canal was reached with a C+ files, #10k file and EDTA. After complete patency is achieved working length was confirmed. Biomechanical preparation was done with rotary files upto 40 6% and single cone obturation was done.



Fig 4: Checking the stability of 3D Guide

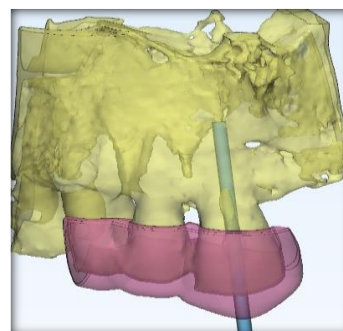


Fig 5: Guided template fabrication



Fig 6 : Strauman drill bur in action through Guided sieve



Fig 7: Working length determined



Fig 8: Post obturation



Fig 9: Post operative clinical view

A major inconvenience of this technique was ledge formation when the calcification extends to middle third of the canal. The reason behind this was the necessity of drilling upto the visibility of the canal , since the drill has a diameter of 0.9mm , or even 1.3mm in others, it is equivalent to a file of 90 with no taper, which is relatively very big and should not be used apically. Another inconvenience is that this treatment was more costly for the patients, as they need to pay for treatment, CBCT, Guide planning and printing. However the treatment might become more and more affordable as many new software and guide designs are emerging.

II. Discussion:

Root canals can be partially or completely obliterated due to several factors such as dentin apposition over the course of life, orthodontic treatments or even the trauma. Severe pulp canal calcifications, partial or complete, becomes a challenging task when accomplished with symptomatic apical periodontitis. Though many of the experienced endodontists can attain high levels of success in such cases, the risk of perforation and tooth loss should also be considered.

Krastl et al and Connert et al, affirmed that the guided endodontic technique could be restricted to anterior teeth due to accessibility and presence of curvatures in the anterior teeth^{8,9}. However, Lara Mendes et al, demonstrated guided root access procedures in second and third molars¹. Therefore, guided endodontic technique is feasible for use in anterior and posterior teeth provided the patient presents no limitations in the mouth opening.

The current case report presented with calcified root canal with symptomatic apical periodontitis due to traumatic history. Due to the complexity of the case, a guided approach for the apex of the tooth using a “3D template” was fabricated.

In this case the armamentarium used were diagnostic instruments, K Files, C+ Files, SS White endo guide bur, CBCT, Endodontic materials. The SS White endo bur in this case has the dimensions of 34 mm of length, head length 2.5 mm, diameter of 1.2mm generated a high wear of dentin. Care was taken to irrigate the bur copiously in order to avoid unnecessary attrition and microcracks during the dentin drilling. The back and forward movements with gradual advances in the canal helped to prevent extensive loads and forces on the dentinal cracks¹.

The time taken for the entire procedure must also be considered. Within few minutes the patency was achieved and without such guidance even the most experienced clinician should be cautious and need to take several radiographs to ensure correct insertion position of the instrument to achieve patency of the canal¹⁰. The reduction in the number of radiographic exposure with this approach is also a benefit but compensates the radiation received by patient in CBCT scanning as the later would be considered as a potential drawback with this technique.

III. Conclusion :

Conventional access opening by guided endodontics is one of the evolving procedure in the treatment of the calcified root canal treatment with most promising results. Though it is having a drawback of being expensive, in recent days by increasing recent advances CBCT is becoming affordable by all the patients and thus this treatment is becoming more feasible and subsequent in its use.

Conflicts of interest: No conflicts of interest are there.

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