

# **A NOVEL METHOD IN INTERVENING PULPAL CANAL OBLITERATION WITH 3D - PRINTING: A CASE REPORT .**

## **AUTHORS**

Dr.K.Shekar, Professor and HOD

Dr.P.Asha Jyothi, P.G. Student

Dr.K.Suhasini, P.G.Student

## **INTRODUCTION**

Pulp canal calcification (PCC), also known as pulp canal obliteration or calcific metamorphosis, is characterized by the deposition of calcified tissue along the canal walls. PCC cases are associated with luxation injuries after dental trauma and many other causes of PCC are pulp response to injuries such as invasive pulp therapy procedures, extended carious lesions, abfractions, and restorations<sup>3</sup>. The use of orthodontic forces may also induce PCC because of interference in the blood supply. Moreover, in elderly patients, the deposition of secondary dentin may also severely reduce the root canal space. As a result, the root canal space can become partially or completely obliterated. Root perforation and canal deviations have been reported as common complications after the treatment of PCC cases, which may ultimately result in tooth loss. Guided endodontics is a new approach to localizing and negotiating seemingly obliterated root canals<sup>1</sup>.

By planning the root canal treatment beforehand in 3 dimensions on the volume of a cone beam computed tomographic (CBCT) scan and merging this with a surface scan, it is possible to manufacture a template to guide the treatment. Buchgreitz et al were the first to show that guided access principles, later known as “guided endodontics,” were accurate enough to be used in vivo<sup>1</sup>. It could be speculated that using a guided access cavity preparation in the treatment of partial or complete PCO, these teeth may be successfully treated without jeopardizing the entire root.

The aim of this study is to create a miniaturized and minimal invasive method by creating a 3D-printed guide to gain access to the obliterated root canals on the basis of the CBCT data.

## CASE REPORT

A 25 year old female patient presented with chief complaint of pain of upper front tooth to our department, past history revealed that there was trauma 6 years back. On clinical examination tooth was tender on percussion, there was no response to thermal and electric pulp tests i.r.t # 11. Radiographic examination showed a severely calcified root canal (figure 1). However, root canal space could only be identified in the middle third with 3D imaging (figure 2). Final diagnosis of symptomatic apical periodontitis was formulated. After analysis and discussion with the patients. Endodontic therapy with guided endodontic access as an initial strategy was the proposed treatment plan, this led for minimally invasive access.



Figure 1. Preoperative radiograph

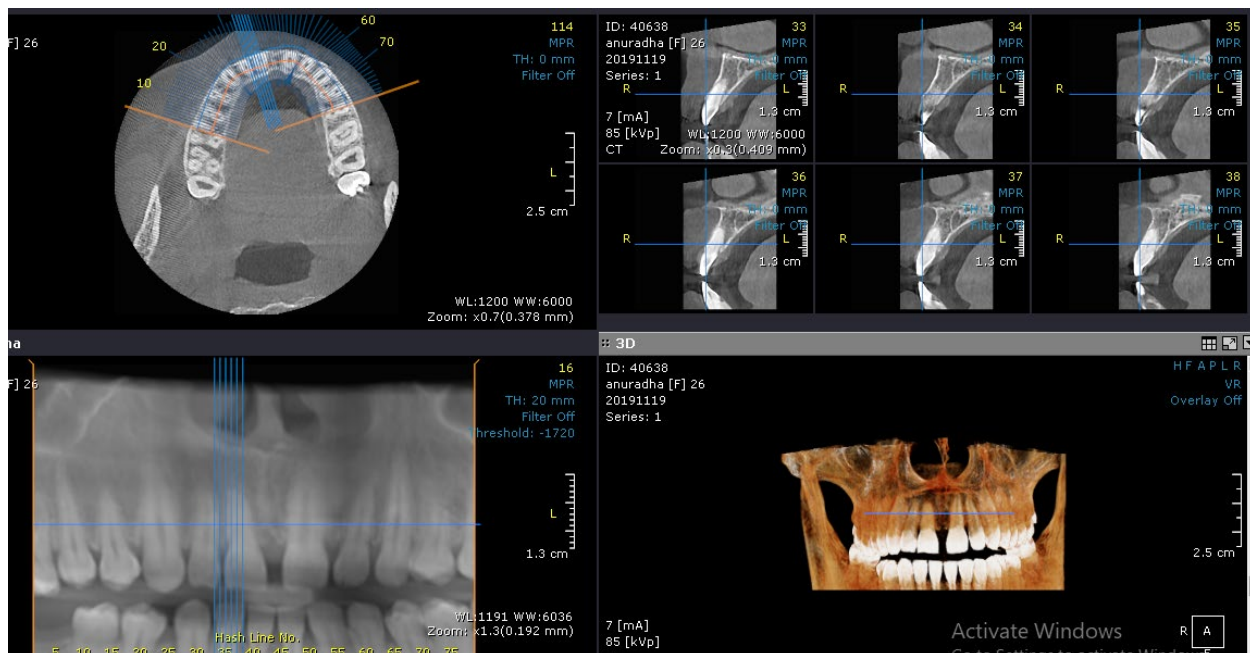


Figure 2. CBCT Image

To create a 3D Printed Template, alginate impression was taken, and a gypsum dental model was created and scanned (figure 3.a). Both CBCT imaging and model scans data were aligned and processed with implant (BLUE SKY BIO) software (figure 3.b). Virtual copy of a drill with a diameter of 1.5 mm and a length of 18mm was superimposed onto the scans in a position that allowed its access to the identified root system within the apical one third of the tooth. The position of the drill was checked in 3 dimensions (figure 3.c). By means of the previously described position of the drill(figure .d), the software automatically created a virtual template by applying its designer tool(figure.e).

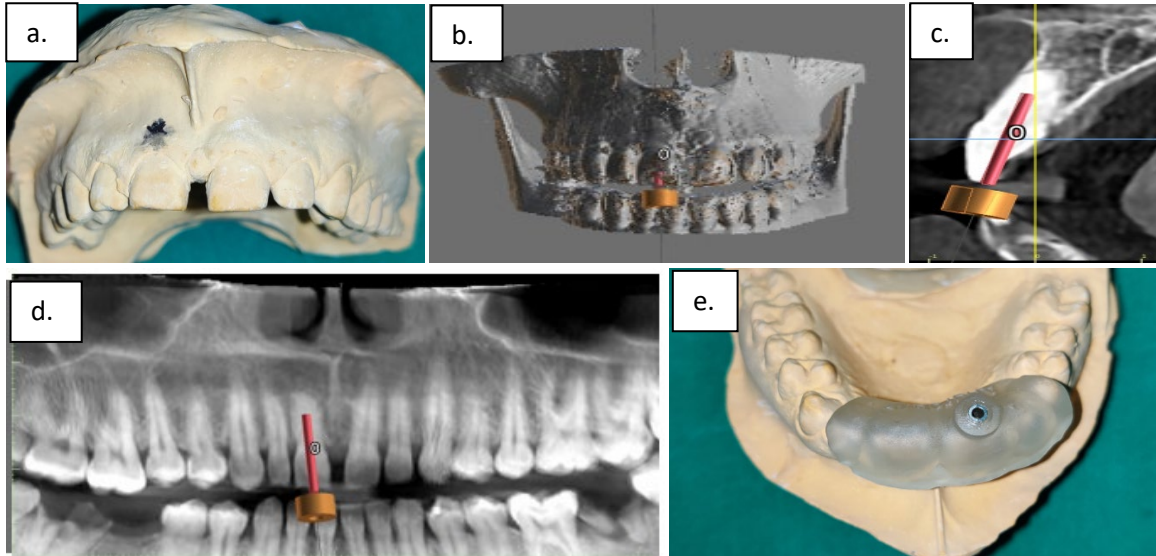


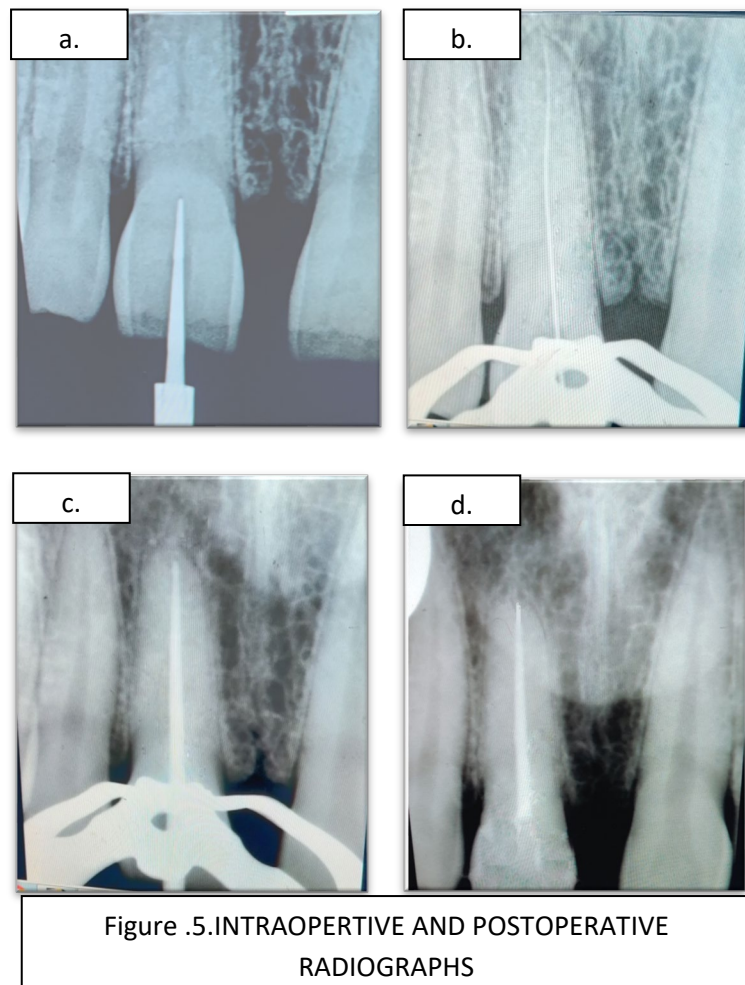
Figure.3. 3D Printing

A guiding sleeve (with a 3.0-mm external diameter, 1.5-mm internal diameter) is virtually customized and incorporated into the planning process to access. The template fit and bur position were checked in the mouth (Figure 4).



Fig.4.TEMPLATE FIT AND BUR POSITION

The bur was coupled to a high speed handpiece .Drilling was performed with pumping movements to penetrate through the calcified part of the root canal under copious irrigation with saline. After 7-mm apical advance, radiograph was taken to confirm the correct position of the bur(figure.5.a).After acheiving canal patency rubber dam clamp was placed , 15 k file was introduced and root canal length electronically & radiographically confirmed (figure.5.b) . The tooth was instrumented with niti rotary system ( 25.06, 30.06 ) and irrigation was done with 2.5 % Naocl , canal was dried, calicium hydroxide intracanal medicament was given .Patient returned after one week asymptomatic and obturation(figure.5.c) was performed using 30.06 GP using AH-plus sealer and access cavity was sealed with composite resin(figure.5.d).Patient is under follow up .



Discussion

Pulp calcifications can occur as a “healing sign.” When unrelated with signs and symptoms of apical periodontitis, endodontic treatment is not indicated<sup>2</sup>. Guided endodontics provided us with a very reliable method to gain access to patent canals even in severely obstructed canals. However, until now, cases presented open access with incisal edge removal in the anterior teeth<sup>3</sup>. Our objective was to gain access to the traditional palatal surface opening, which was shown to be entirely possible with Orifice Directed Conservative Access. The development of oral scans provided benefits in the precision of models. Direct oral scanning delivers a faster and more reliable copy of the teeth, which is paramount for success in cases that demand high sensitivity<sup>3</sup>.

However, even when direct oral scanning is not possible, the technique can still be performed. As in the case presented in this report, an impression was made. The model obtained was then scanned in a radiologic center so that the template could be constructed. Although the planning of Guided Endodontics seems to be very time-consuming, the chair-time during treatment is minimal. The additional costs for CBCT and the template may be justified by the reduction of the likelihood of iatrogenic errors such as perforation, thereby increasing the chance of tooth retention. The costs for an implant would be higher if conventional treatment with technical failure led to tooth extraction.

There are shortcomings associated with this technique. Due to the space needed for the template and the bur, treatment might not be feasible in the posterior region, but can be modified for treating molars by using an intracoronal guide technique<sup>4</sup>. The bur diameter in the cases presented (0.8 mm) generated a low wear of dentin. In fact, because of the large diameter, in previously reported cases caused high wear of dentin where care was taken to irrigate the bur copiously. Notably, even with the large diameter of the bur (compared with conventional endodontic instruments), it was possible to reach the patent canal without unnecessary wear of the incisal borders of the teeth. The canals were promptly reached with #10 or #15 K-files. The time of the entire procedure must be taken into consideration. Within a few minutes, patency was achieved. Without this guidance, even the most experienced clinicians should be cautious and take several radiographs to ensure the correct insertion position of the instrument used to achieve the canal<sup>6</sup>. The reduction in the number of radiographs with this approach is also a benefit and compensates for the radiation received by the patient in CBCT scanning because the latter would be considered as a possible drawback of this technique<sup>5</sup>. Intraoperative radiographs in at least 2 angulations was taken to certify that the bur does not deviate from its path<sup>6</sup>.

Conventional root canal treatment and apical surgery are alternative treatment options in PCC cases<sup>6</sup>. Although experienced clinicians can achieve high levels of success with conventional root canal treatment in calcified canals, 3 factors must be considered: it is time-consuming, there is a risk of perforations or excessive tooth substance removal, and there is excessive patient exposition to x-rays. Apical surgery is a more invasive and discomformable approach to the patient; however, it must be considered as the treatment of choice in cases of PCC in which a straight line to the patent canal cannot be achieved by the bur with guided endodontics as in cases of severely curved canals<sup>6</sup>.

## CONCLUSION

This case report about a severely calcified maxillary central incisor in which the planning and execution of a minimally invasive coronal access reducing chair time and risk of iatrogenic damage to the root and provides quicker, safer, and in a predictable way to improve the long-term prognosis of tooth.

## REFERENCES

1. Buchgreitz J, Buchgreitz M, Mortensen D, Bjørndal L. Guided access cavity preparation using cone-beam computed tomography and optical surface scans-an ex vivo study. *Int Endod J* 2016;49:790–5.
2. Robertson A, Andreasen FM, Bergenholtz G, et al. Incidence of pulp necrosis subsequent to pulp canal obliteration from trauma of permanent incisors. *J Endod* 1996;22:557–60.
3. Fonseca Tavares, W. L., Diniz Viana, A. C., de Carvalho Machado, V., Feitosa Henriques, L. C., & Ribeiro Sobrinho, A. P. (2018). Guided Endodontic Access of Calcified Anterior Teeth. *Journal of Endodontics*, 44(7), 1195–1199.
4. Buchgreitz J, Buchgreitz M, Bjørndal L. Guided root canal preparation using conebeam computed tomography and optical surface scans—an observational study of pulp space obliteration and drill path depth in 50 patients. *Int J Endod* 2019;52:559–68
5. Torres A, Shaheen E, Lambrechts P, et al. Microguided endodontics: a case report of a maxillary lateral incisor with pulp canal obliteration and apical periodontitis. *Int Endod J* 2019;52:540–9.
6. Tavares WL, Lopes RC, Menezes GB, et al. Non-surgical treatment of pulp canal obliteration using contemporary endodontic techniques: case series. *Dental Press Endod* 2012;2:52–8.



## Contributors' Form

I / We certify that I/we have participated sufficiently in the intellectual content, conception and design of this work or the analysis and interpretation of the writing of the manuscript, to take public responsibility for it and have agreed to have my/our name listed as a contributor. I/we certify that all the data collected during the study is presented in this manuscript and no data from the case report has been or will be published by the editors, I/we will provide the data/information or will cooperate fully in obtaining and providing the data/information on which the manuscript is based, their assignees.

We give the rights to the corresponding author to make necessary changes as per the request of the panel, do the rest of the correspondence on guarantor for the manuscript on our behalf.

All persons who have made substantial contributions to the work reported in the manuscript, but who are not authors, are named in the Acknowledgment permission to be named. If I/we do not include an Acknowledgment that means I/we have not received substantial contributions from non-authors and Name Signature Date signed

1 Dr. Sherkar K *Sherkar*  
28/12/19

2 Dr. Arha Jyoti. P *Arha*  
28/12/19

3 Dr. K. Subasini *Subasini*  
28/12/19

4 \_\_\_\_\_

(up to four authors for case report)