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CASE REPORT

Conquering Calcification: How PriciGuide® system is Transforming Endodontics. A Case Report

Cómo vencer la calcificación: cómo el sistema PriciGuide® está transformando la endodoncia. Informe de un caso

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ABSTRACT

Introduction: traumatic injuries are a common cause of pulp canal obliteration (PCO), frequently af-fecting the maxillary central incisors. PCO presents significant challenges for root canal treatment due to procedural complexities and risks of iatrogenic errors. The PriciGuide® system, offers an inno-vative solution for guided endodontics, enhancing precision, visibility, and efficiency.

Case Report: a 26-year-old male presented with a discoloured upper front tooth, tender on percussion and non-responsive to cold tests. Radiographic evaluation revealed a widened periodontal ligament (PDL) space, and the tooth was diagnosed with PCO and symptomatic apical periodontitis. The patient opted for root canal treatment using the PriciGuide® system. Cone-beam computed tomography (CBCT) and a diagnostic impression were used to create a customized guide. The PriciGuide® system facilitated precise access cavity preparation, and the root canal was instrumented with Hyflex CM files and irrigated with sodium hypochlorite with Twin Kleen enhanced by passive ultrasonic activa-tion. The tooth was obturated with gutta-percha and restored with an all-ceramic crown. At a one-year follow-up, the tooth remained asymptomatic both clinically and radiographically.

Conclusions: the PriciGuide® system effectively addressed the challenges of root canal treatment in a tooth with PCO, ensuring precise access, preservation of tooth structure, and optimal treatment out-comes. This case highlights the system's potential to advance guided endodontics and improve clinical success rates in complex cases.

Keywords: Pulp Canal Obliteration; Guided Endodontics; Priciguide® System; Static Guide; Digital Den-tistry; 3D Printing.

RESUMEN

Introducción: las lesiones traumáticas son una causa común de obliteración del conducto pulpar (OCP), que afecta con frecuencia a los incisivos centrales superiores. La OCP presenta desafíos signifi-cativos para el tratamiento del conducto radicular debido a las complejidades del procedimiento y los riesgos de errores iatrogénicos. El sistema PriciGuide® ofrece una solución innovadora para la endo-doncia guiada, mejorando la precisión, la visibilidad y la eficiencia.

Reporte de caso: un hombre de 26 años se presentó con un diente frontal superior descolorido, sensi-ble a la percusión y que no respondía a las pruebas de frío. La evaluación radiográfica reveló un espa-cio ensanchado del ligamento periodontal (LPD), y el diente fue diagnosticado con OCP y periodontitis apical sintomática. El paciente optó por el tratamiento del conducto radicular utilizando el sistema PriciGuide®. Se utilizaron una tomografía computarizada de haz cónico (CBCT) y una impresión de diagnóstico para crear una guía personalizada. El sistema PriciGuide® facilitó la preparación precisa de la cavidad de acceso, y el conducto radicular se instrumentó con limas Hyflex CM y se irrigó con hipoclorito de sodio con Twin Kleen mejorado mediante activación ultrasónica pasiva. El diente se ob-turó con gutapercha y se restauró con una corona totalmente de cerámica. En un seguimiento de un año, el diente permaneció asintomático tanto clínica como radiográficamente.

Conclusiones: el sistema PriciGuide® abordó eficazmente los desafíos del tratamiento del conducto radi-cular en un diente con OCP, asegurando un acceso preciso, la preservación de la estructura dental y resultados óptimos del tratamiento. Este caso destaca el potencial del sistema para hacer avanzar la endodoncia guiada y mejorar las tasas de éxito clínico en casos complejos.

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Palabras clave: Obliteración del Conducto Pulpar; Endodoncia Guiada; Sistema Priciguide®; Guía Está-tica; Odontología Digital; Impresión 3D.

INTRODUCTION

Traumatic injuries are among the leading causes of pulp canal obliteration (PCO), with the maxillary central incisors being the most commonly affected teeth.[1,2] Following trauma, the affected tooth can become necrotic, undergo internal resorption, or experience obliteration of the pulp chamber and root canals due to hard tissue deposition.[3] This deposition results in a yellowish discoloration of the tooth, attributed to increased dentin formation.[4]

PCO progresses from the coronal structure towards the apex and is radiographically classified as partial pulp canal obliteration (PPCO) or total pulp canal obliteration (TPCO).[5,6] The American Association of Endodontics categorizes root canal treatment in such cases as highly challenging.[7] Locating and preparing the root canal in teeth with PCO is difficult and prone to errors, such as excessive tooth structure loss, canal deviation, and perforation, all of which impede reaching the working length.[8]

To address these challenges, guided endodontics has been introduced, drawing inspiration from guided implantology technique that utilize 3D printed templates generated from CBCT and intraoral scans. These templates facilitate precise access cavity preparation, preserving as much tooth structure as possible, regardless of the dentist's experience level.[9] However, traditional guided endodontic techniques with sleeves have limitations, including restricted visibility, inadequate coolant flow to the bur, resultant bur overheating, and the necessity for specialized long shank burs.[10]

To overcome these limitations, Roots to Cusps® Private Limited, based in Bengaluru, India, developed the PriciGuide® system. This system features a sleeveless design, employing guide rails to orient the bur, thereby enhancing visibility, eliminating the need for specialized long shank burs, and ensuring proper coolant flow to prevent bur overheating.[11]

This article explores the utilization of the PriciGuide® system, a novel patented technology, for access cavity preparation in a central incisor with PCO. By examining how this innovative system enables clinicians to achieve optimal access for root canal treatment without any iatrogenic complications, this article aims to contribute to the evolving landscape of guided endodontics.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given his consent for his images and other clinical information to be reported in the journal.

CASE REPORT

A 26-year-old male patient presented to the Department of Conservative Dentistry and Endodontics with a discoloured upper front tooth (figure 1A). The tooth was tender on percussion, and radiographic evaluation revealed a widened periodontal ligament (PDL) space (figure 1B). A cold test indicated no response, leading to a diagnosis of pulp canal obliteration with symptomatic apical periodontitis, necessitating root canal treatment (RCT). The patient was given the option to perform the root canal treatment using either the conventional method without the guide or the guided endodontic method using the PriciGuide® system. The patient opted for performing the root canal treatment using the PriciGuide® system.

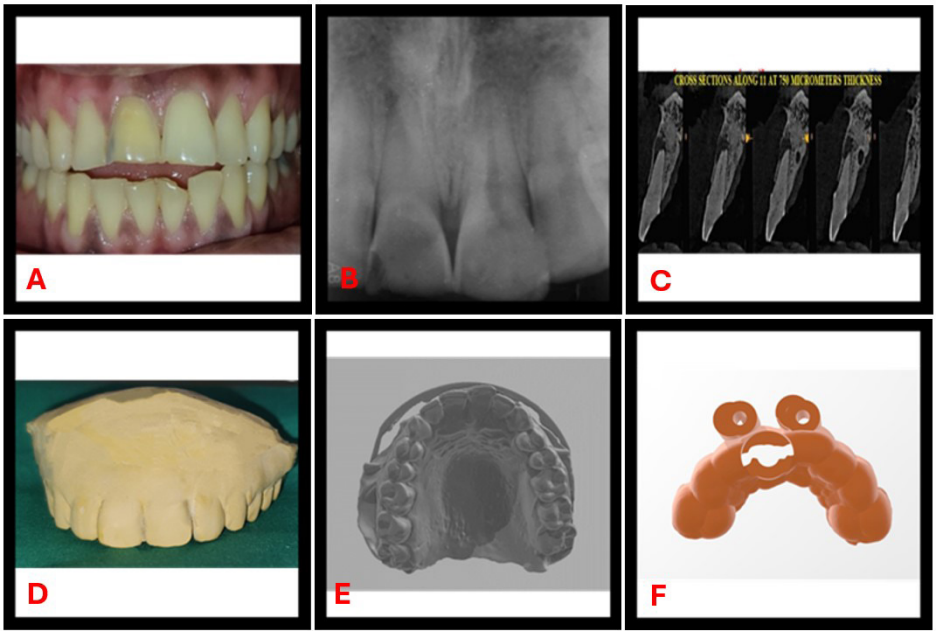

Figure 1. A) Pre-operative photograph showing discoloured tooth in relation to 11; B) Pre-operative radiograph showing calcified canal in relation to 11; C) CBCT image showing calcified canal; D) Diagnostic cast; E) STL file of the diagnostic cast; F) Customized guide

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The patient underwent cone-beam computed tomography (CBCT) to obtain the Digital Imaging and Communications in Medicine (DICOM) file (figure 1C), and a diagnostic cast (figure 1D) which was then converted into a digital scan (figure 1E) was taken to assist in crafting a patient-specific guide. The CBCT data and impression were sent to Roots to Cusps® Private Limited for the fabrication of a customized guide (figure 1F) to be used with the PriciGuide® system (figure 2A).

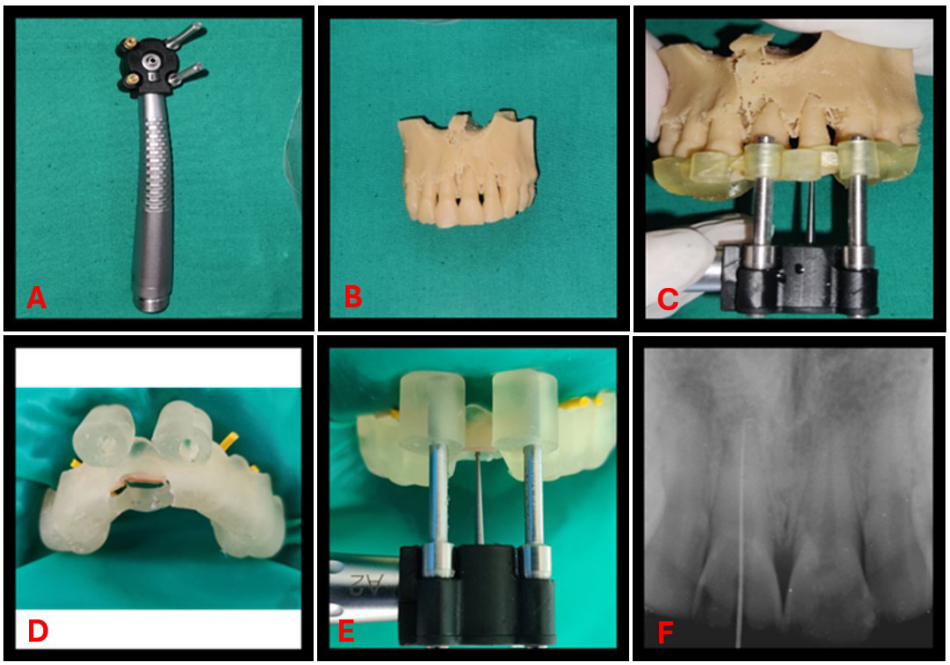

Figure 2. A) PriciGuide® system; B) 3D printed model of the patient's maxilla; C) Trial of the access opening performed on the 3D printed patient's model; D) Guide placed on the teeth; E) PriciGuide® system used to perform access opening; F) Working length determination

The CBCT data was used to 3D print the patient's maxilla using resin material (figure 2B), allowing us to perform the access opening on the model before proceeding to the patient. Upon confirmation of the access cavity on the model (figure 2C), local anaesthesia was administered to anesthetize tooth 11, and rubber dam isolation was achieved. The sleeveless guide was positioned on the tooth (figure 2D) and the attachment consisting of guide rails was secured on the airotor, and the PriciGuide® system was employed to perform the access opening (figure 2E). The guide rails traversed through the sleeveless guides to orient the bur, ensuring that the tooth was drilled in the pre-determined direction. The height of the sleeveless guides prevented the system from advancing beyond the planned depth. Working length determination was done using an electronic apex locator and confirmed radiographically (figure 2F).

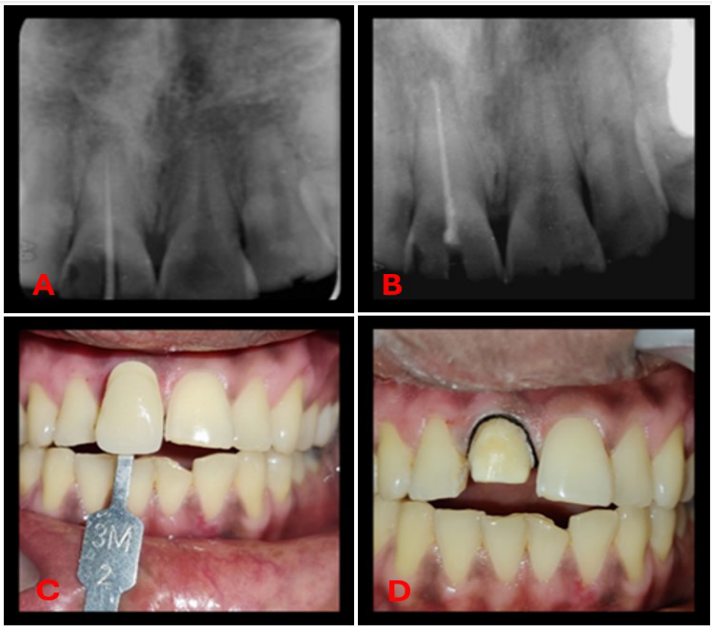

Figure 3. A) Master cone; B) Obturation; C) Shade selection; D) Crown preparation and retraction cord placement

The root canal was instrumented with rotary files (Hyflex CM files), and irrigation was performed using sodium hypochlorite with Twin Kleen, enhanced by passive ultrasonic activation. A final rinse was performed using saline. The master cone was confirmed radiographically (figure 3A), and the tooth was obturated using gutta-percha (figure 3B).

Shade selection was performed using the VITA Toothguide 3D-MASTER® shade guide (Figure 3C). Crown preparation was done to accommodate an all-ceramic crown. To record the margins, retraction cord was placed prior to recording the impression and removed just before taking the impression (figure 3D). Upon receiving the all-ceramic crown from the lab (figure 4A), the crown was checked on the patient. Confirming the fit, the crown was cemented (figure 4B).

Figure 4. A) All ceramic crown on cast; B) Cementation; C) 1 year follow up

One year following the root canal treatment, the patient visited the department for a recall visit. The tooth was asymptomatic both clinically and radiographically (figure 4C), indicating the success of the treatment.

DISCUSSION

Traumatic dental injuries (TDI) affect nearly one billion people worldwide, with childhood trauma being a common occurrence.[12] Maxillary central incisors are the most frequently involved teeth in such injuries.[13] The incidence of pulp canal obliteration (PCO) following trauma ranges from 4 % to 24 %.[14]

Cold testing is essential for differentiating between vital and non-vital teeth. A lack of response to the cold test suggests pulp necrosis and non-vitality.[15] Cone-beam computed tomography (CBCT) is invaluable for evaluating teeth in three dimensions, providing a detailed view of calcification extent, which is crucial for accurate diagnosis. Traditional periapical radiography, with its two-dimensional perspective, offers limited information.[16]

Guided access opening with the PriciGuide® system preserves dentin, thereby enhancing the tooth's fracture resistance and long-term prognosis. This technique is straightforward and delivers consistent results regardless of the dentist's experience level.[9]

In this case, the PriciGuide® system was selected for root canal treatment due to its superior visibility during the procedure. This system allows the treatment to be halted immediately if the bur's direction deviates from the planned path, even before confirming with a radiograph. Unlike traditional guides with sleeves that require longer burs to navigate the minimum 5 mm sleeve height and avoid deviations, the PriciGuide® system's open architecture eliminates this need. This design ensures that coolant easily reaches the bur, preventing overheating. Additionally, the PriciGuide® system's dual guide rails provide more accurate bur orientation than sleeve-based guides, leading to reduced deviation values. The absence of a sleeve also allows the system to be used effectively for posterior teeth.[11]

Hyflex CM files were utilized for the instrumentation of the canals due to their flexibility and resistance to cyclic fatigue.[17] Passive ultrasonic irrigation was employed to enhance irrigant penetration, ensuring thorough disinfection of the root canal system.[18] For prosthetic rehabilitation, an all-ceramic crown was chosen for its superior aesthetics.

Guided endodontic treatment proves highly beneficial for dentists managing cases with pulp canal obliteration, even without an operating microscope.[19]

However, the guided endodontic procedure is limited in its applicability to straight canals or up to the curvature area.[20] Isolating multiple teeth is necessary to place the guide. Despite these limitations, the guided endodontic technique is more cost-effective than extracting the tooth due to iatrogenic errors that might occur during the search for the canal in case of PCO and resulting in the placement of an implant.

CONCLUSIONS

In the present case, the PriciGuide® system has demonstrated its effectiveness in managing a tooth with pulp canal obliteration (PCO). The system is capable of minimizing iatrogenic complications while facilitating precise access cavity preparation and preserving tooth structure. The system shows great promise for a variety of challenging endodontic scenarios, making it highly relevant for new possibilities such as performing minimally invasive access openings, access openings through crowns, preparing post spaces, and retrieving broken posts. It may also extend its applicability to implantology. Further studies are needed to fully explore its potential and impact in these areas.

FINANCING

The PriciGuide® system used in this case was sponsored by Roots to Cusps® Private Limited.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

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Formal analysis: Varun Prabhuji, Pari Anand, Srirekha A, Archana S.
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Drafting - original draft: Varun Prabhuji, Pari Anand, Srirekha A, Archana S.
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