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CASE REPORT

Dental Aesthetics and Functional Rehabilitation in a Case of Reinfection and Tooth Loss: A Case Report

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ABSTRACT

In this clinical report, a 41-year-old Malay female patient presented with reinfection of her root treated central incisor teeth. There was a significant loss of coronal tooth structure in the maxillary anterior teeth and missing posterior teeth requiring a restorative solution. A combination of conventional prosthodontic techniques and a digital workflow was employed for optimal outcomes. To address the loss of coronal tooth structure, indirect all-ceramic restorations with post core were chosen. These restorations offer excellent aesthetics and durability, closely resembling natural teeth. The utilization of digital technology ensured precise measurements and fabrication, resulting in restorations that fit accurately and function optimally. For the bilateral missing teeth in the first molar region that has impacted the patient's ability to chew effectively, implant-supported crowns were provided to restore the masticatory performance. Dental implants provided a stable foundation for the crowns, improving chewing efficiency and overall oral function. The treatment approach successfully restored both aesthetics and functionality, significantly enhancing the patient's quality of life. Regular follow-up visits and maintenance protocols were implemented to ensure long-term success.

INTRODUCTION

Restoring endodontically treated teeth (ETT)

remains a clinical challenge and a topic of ongoing debate in contemporary dentistry (Caussin et al., 2024). Restoring pulpless teeth requires a careful approach to maintain the biomechanical integrity and longevity of the restoration while achieving functional and aesthetic outcomes (Rathee et al., 2023). One key factor in the clinical success of these restorations is the preservation of coronal tooth structure, which plays a vital role in sustaining the tooth's adhesive, functional, and aesthetic balance (Naumann et al., 2018).

Advancements in adhesive dentistry and restorative materials have broadened the options for reinforcing and protecting ETT (Caussin et al., 2024). These developments offer a conservative means to enhance the structural resilience of ETT while closely approximating the mechanical properties of natural dental tissues (Bhalla et al., 2020). For cases where minimal coronal structure is lost, directly bonded restorations are often effective, providing short-term solutions that support structural stability without the need for extensive intervention (Mannocci et al., 2022). In contrast, teeth with moderate to significant coronal loss may benefit more from indirect restorations, which, when combined with appropriate adhesive techniques, can provide the necessary reinforcement for long-term functionality (Chrepa at al., 2014).

This clinical report describes the use of both conventional and digital prosthodontic approaches to restore a case of reinfected root-treated central incisors with substantial coronal tooth loss. Additionally, it addresses the masticatory challenges posed by missing posterior teeth through implant-supported restorations. The treatment strategy aimed to restore both aesthetic and functional aspects, thereby enhancing the patient's quality of life and delivering a robust and enduring solution.

CASE PRESENTATION

The patient, a 41-year-old Malay female, presented with swelling and pus discharge from her upper front teeth. She had previously been referred by a general dentist due to failed root canal treatments on teeth 11 and 21, completed three years prior. Approximately a year after the initial treatment, she began experiencing intermittent swelling in this area, though it was not accompanied by pain.

On clinical examination, the patient was found to be partially edentulous in the lower arch, with multiple heavily restored teeth and missing bilateral mandibular first molars (Figure 1). Teeth 11 and 21 were restored with composite and metal posts, both of which had developed secondary caries under the composite (Figure 2). These teeth were also tender to percussion and palpation.

Radiographs revealed posts in both 11 and 21 with deficient obturation material and

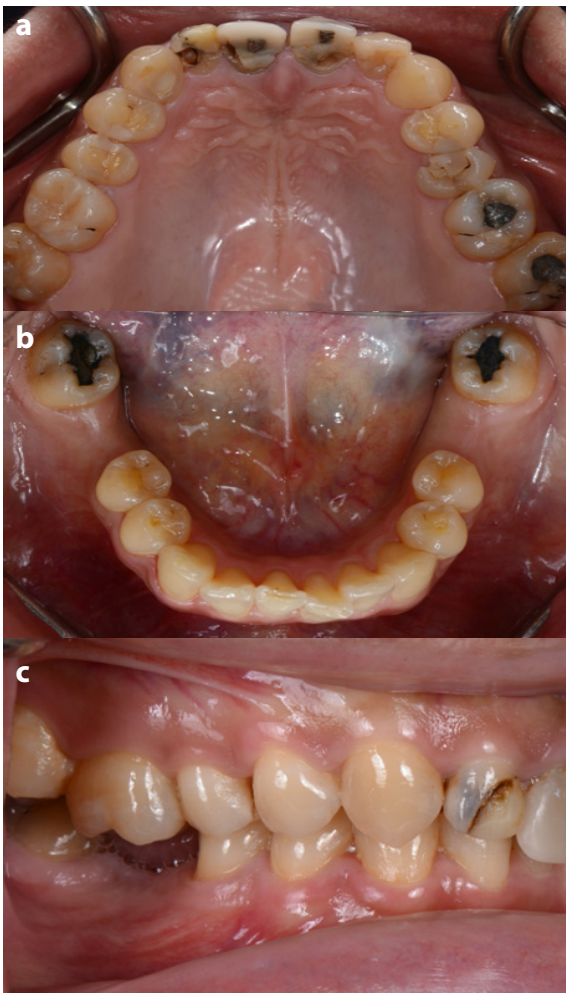


Figure 1: Intraoral pre-operative picture. a) maxillary arch b) mandibular arch c) right buccal view d) left buccal view e) frontal view

Figure 2: Area of presenting complaint

periapical radiolucency at the root of tooth 21, suggesting a chronic infection. Radiolucencies were also observed on adjacent teeth (12, 22, and 25), indicative of secondary caries (Figure 3). Teeth 13, 11, and 21 was root treated.

After removing the existing restorations and metal posts on teeth 11 and 21, secondary caries were detected and removed. A ferrule of 2 mm height and 1 mm circumference was achieved on tooth 11, and 4 mm height with 1.5 mm circumference on tooth 21, meeting the minimal structural requirements for restorability (Figure 4).

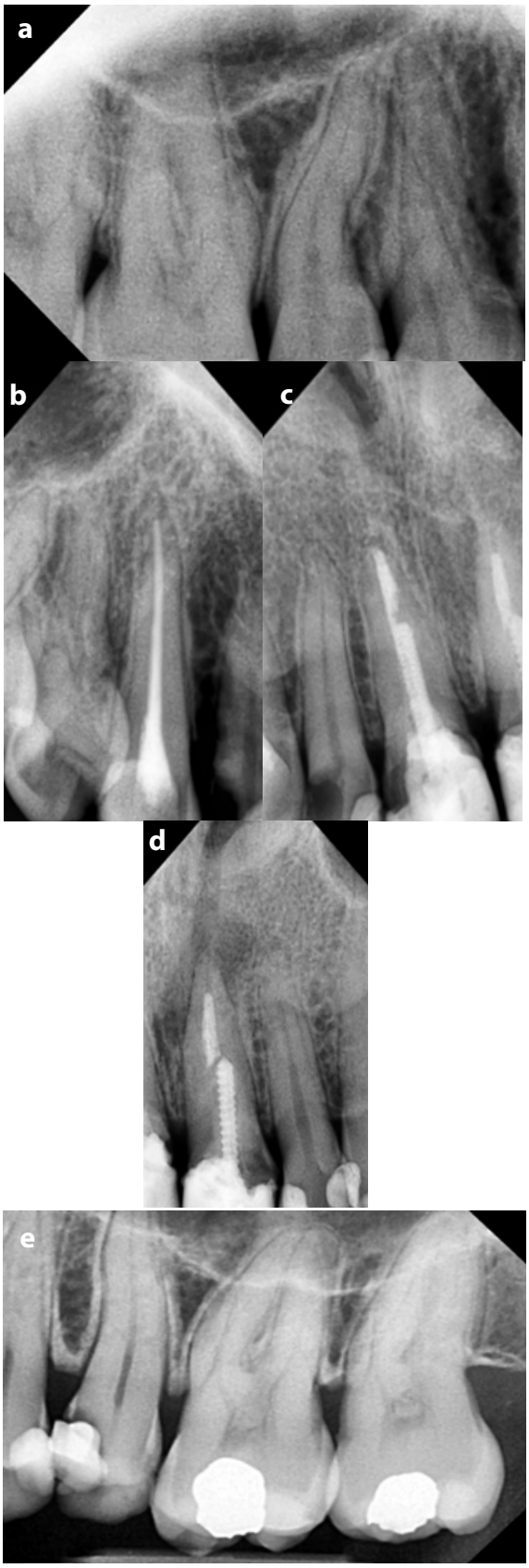


Figure 3: Periapical radiograph. a) teeth 16-15 b) teeth 14-13 c) teeth 12-11 d) teeth 21-22 e) teeth 23-27

Primary impressions were taken using irreversible hydrocolloid material (Figure 5), and study models were fabricated for diagnostic purposes. Facebow transfer and interocclusal records were taken, and the study casts were mounted on a semi-adjustable articulator. A conformative approach was planned, with a wax-up to help the patient visualize the treatment outcome, and a diagnostic setup confirmed adequate restorative space (Figure 6). Canine guidance was planned for excursive movements following the existing occlusal scheme.

The diagnosis included dental biofilm-induced gingivitis on a normal periodontium, chronic apical abscess on previously treated 11 and 21, and a partially edentulous mandibular arch. Treatment began with removal of infected obturation material on 11 and 21, followed by diet counseling, oral hygiene instruction, fluoride therapy, and non-surgical periodontal therapy. Direct composite restorations were placed on 12 and 22.

During the pre-prosthetic phase, endodontic retreatment on teeth 11 and 21 involved thorough cleaning and shaping of the canals, followed by disinfection with 5% sodium hypochlorite (NaOCl). To ensure an optimal seal, an apical plug of mineral trioxide aggregate (MTA) (Endo-eze MTA Flow, Ultradent) was placed 5 mm into each canal (Figure 7). The protocol for constructing a direct anatomical post involved several steps (Figure 8). First, the posts are cleaned with 37% phosphoric acid and applying a thin layer of

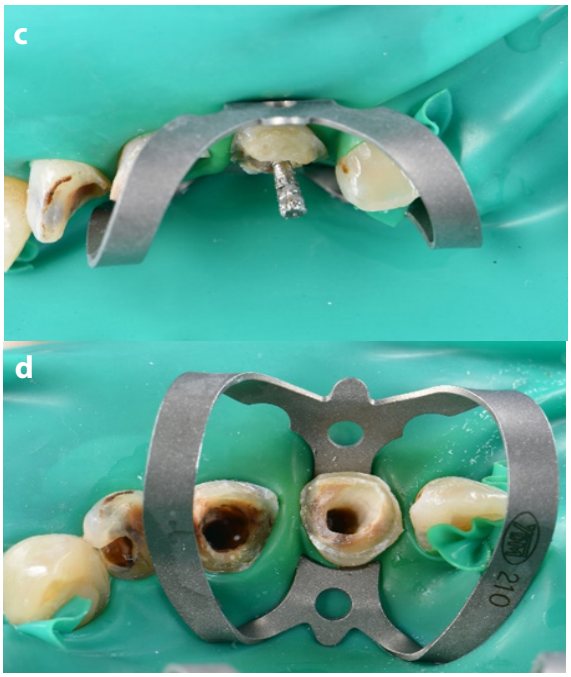


Figure 4: Access restorability a) and b) tooth 11 c) and d) tooth 21

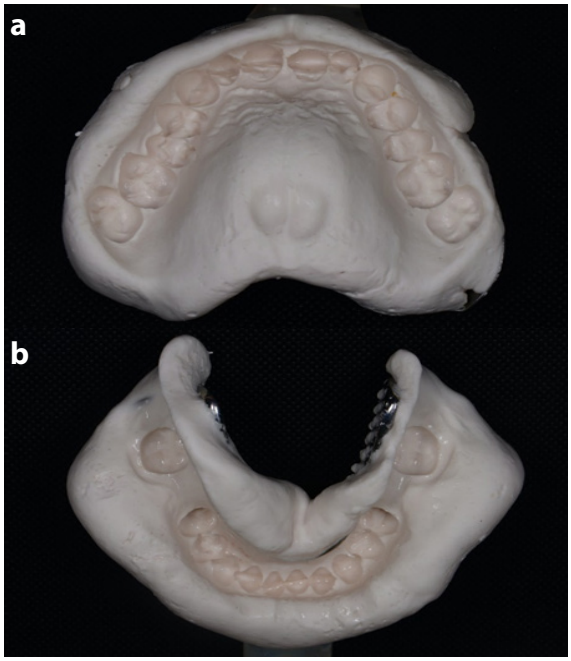
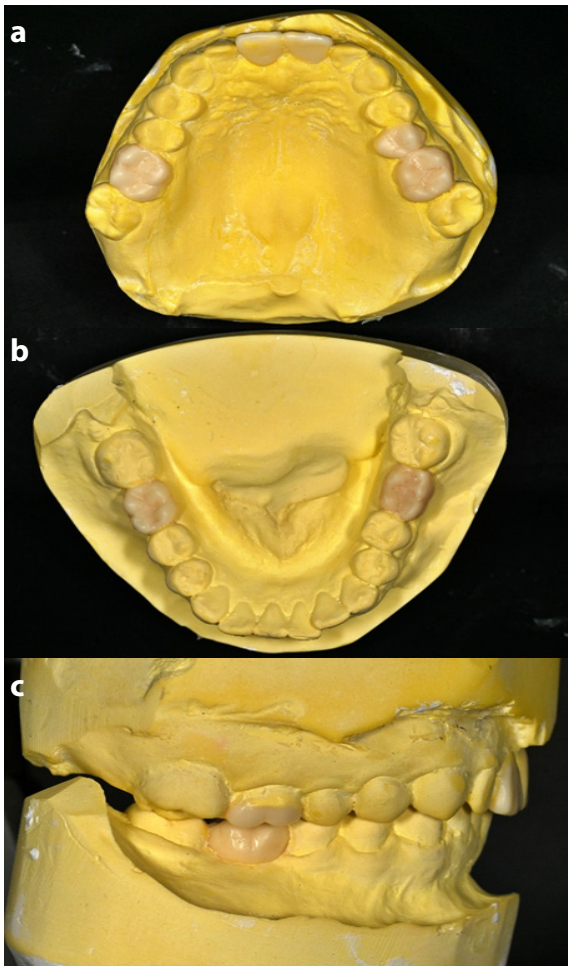


Figure 5: a) maxillary primary impression b) mandibular primary impression

adhesive. After isolating the root canal with a glycerine-based gel and micro brush, a micro-hybrid composite resin was introduced, and the main fiber glass post, along with accessory posts, was positioned within the canal. An initial photo-activation of 10 seconds was performed, followed by extra-oral curing of the post for an additional 40 seconds. The post was then treated with phosphoric acid and adhesive, while the root canal was conditioned and dried. A dual resin cement was used to bond the anatomical post to the canal, and after excess cement was removed, a composite core was created and cured. Following this, the tooth was prepared for the final prosthesis.

For implant placement in the edentulous mandibular regions at sites 36 and 46, a clinical and radiographic evaluation confirmed adequate bone width and height. The Cone Beam CT scan, taken with a radiographic stent, showed sufficient bone



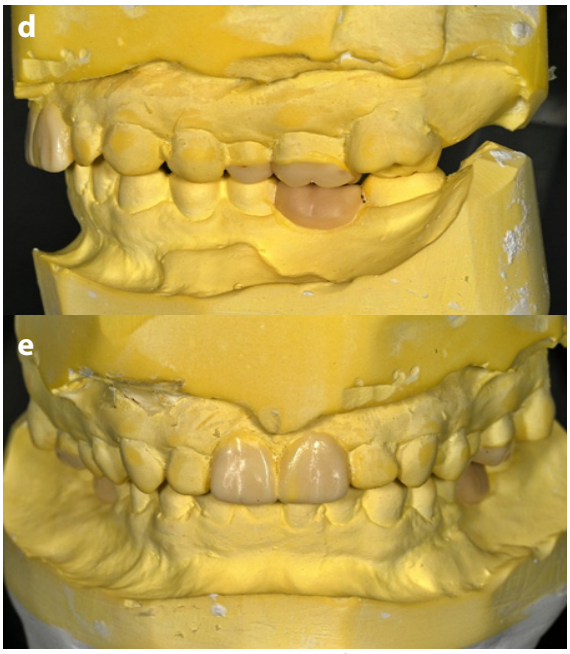


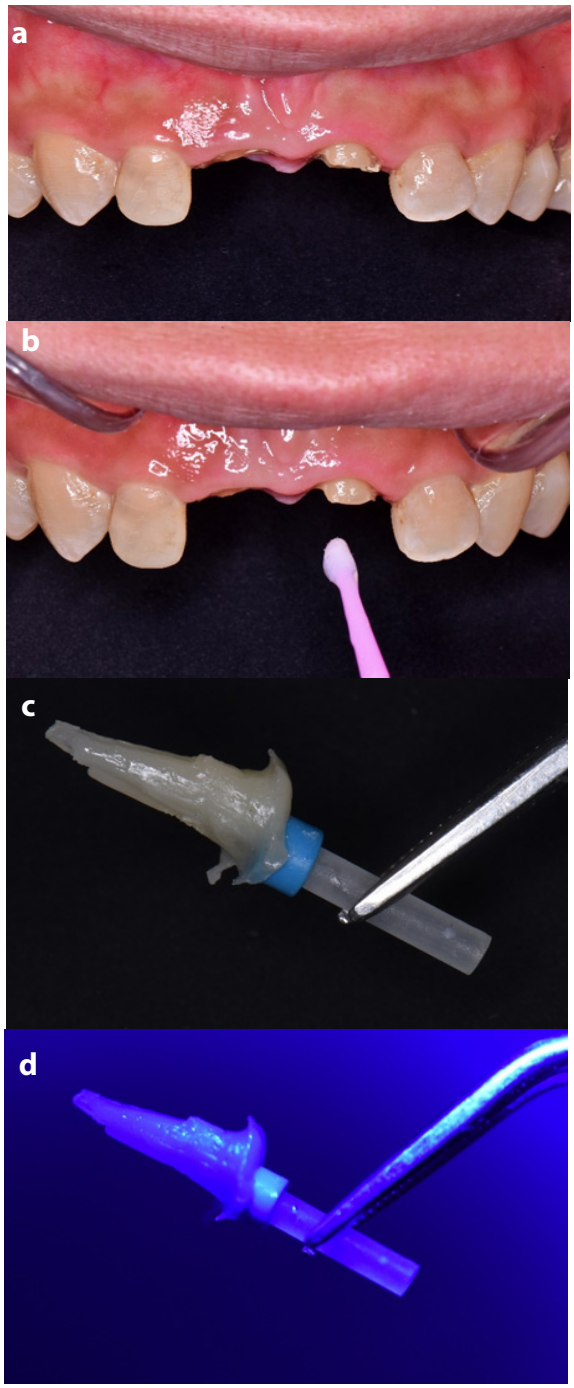
Figure 6: Diagnostic wax-up of study model mounted on semi-adjustable articulator . a) left buccal view b) frontal view c) right buccal view d) maxillary occlusal view e) mandibular occlusal view

Figure 7: Obturation with MTA plug

availability to support 10 mm implants (Figure 9). During surgery, a mid-crestal, full-thickness mucoperiosteal flap with a relieving incision was made. A ø 4.5 x 10 mm Anyridge® (Megagen, South Korea) implant was placed at

site 36 and 46, using a surgical guide (Figure 10). Cover screws were positioned post-placement, and sutures were removed after one week, with healing progressing well after four weeks. Two months post-placement, a second-stage surgery was performed to replace the cover screws with healing abutments (Figure 11).

In the definitive prosthodontic phase, full coverage monolithic lithium disilicate restorations were designed for teeth 11 and



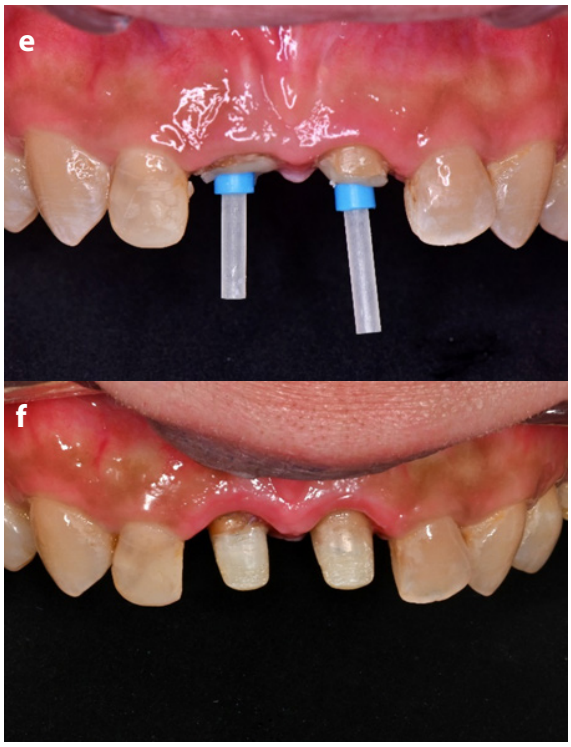


Figure 8: a) Cleaning of the posts after root canal treatment b) isolation of the root canal with a glycerine-based gel c) removal of the anatomical post after fitting in root canal d) complementary extra-oral photo-activation e) cementation of direct anatomical post f) teeth preparation.

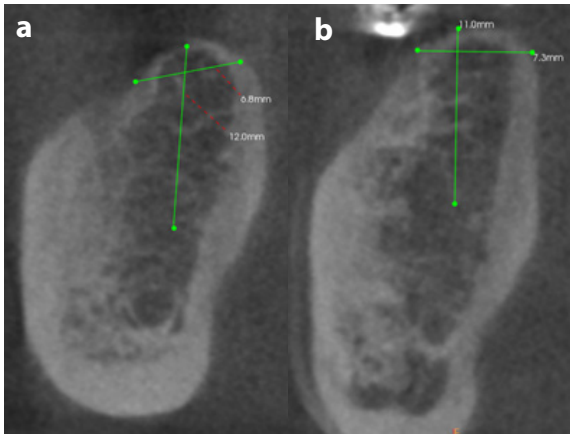


Figure 9: Cone Beam CT scan of bone dimension a) 46 site b) 36 site

21, while partial coverage restorations were fabricated for teeth 16, 25, and 26. Zirconia implant-supported crowns were designed for sites 36 and 46. Teeth were prepared based on the prosthesis design, and intraoral digital impressions and bite registrations were obtained (Figure 12). Using CAD/CAM

Figure 10: Periapical radiograph post-implant placement a) tooth 46 b) tooth 36

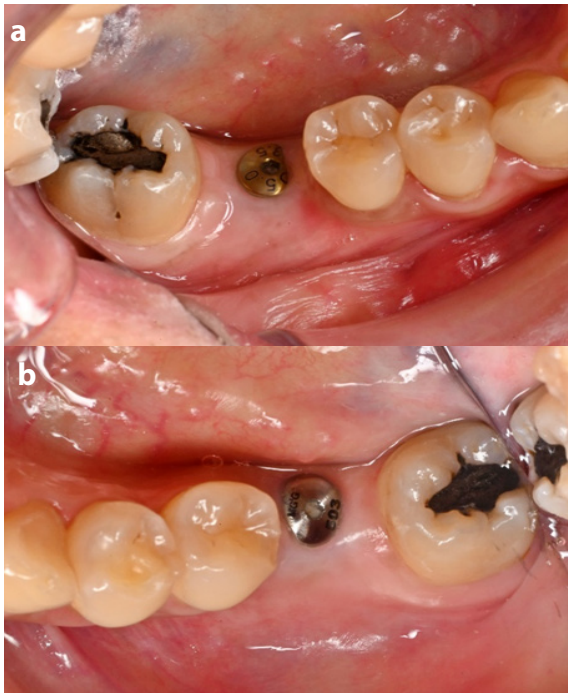


Figure 11: Placement of healing abutment a) tooth 46 b) tooth 36

technology, custom restorations were designed and fabricated, culminating in the delivery of all final prostheses to restore the patient's function and aesthetics (Figure 13).

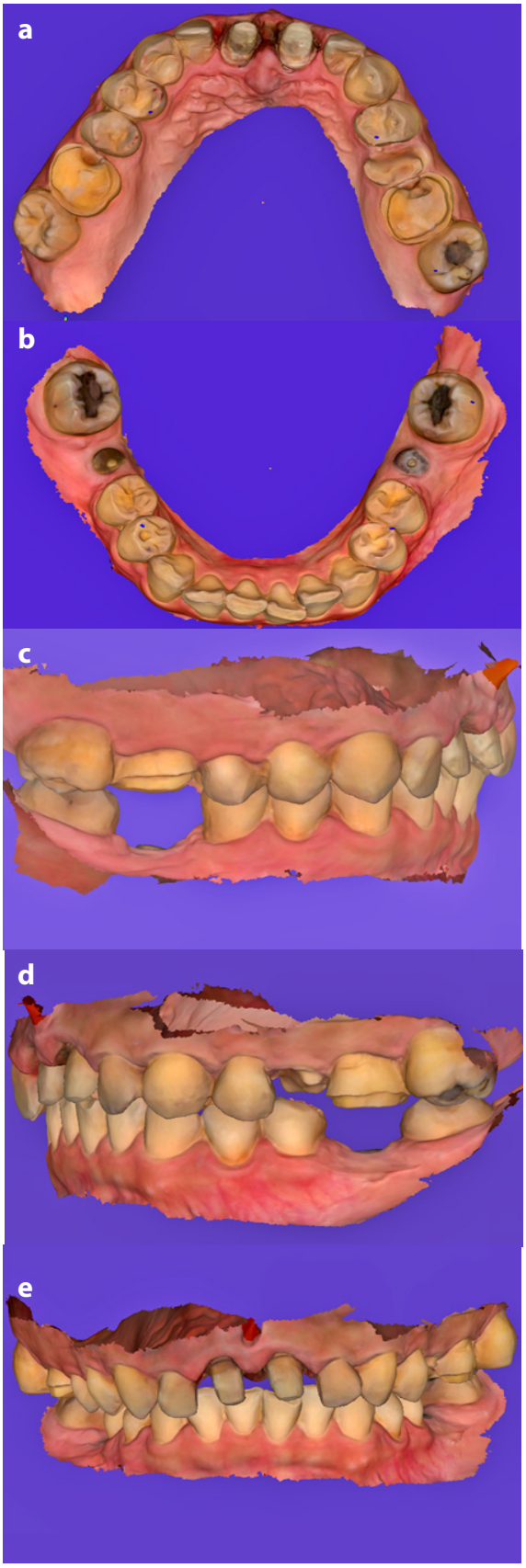


Figure 12: Digital Intraoral impression a) maxillary arch b) mandibular arch c) right buccal view d) left buccal view e) bite registration

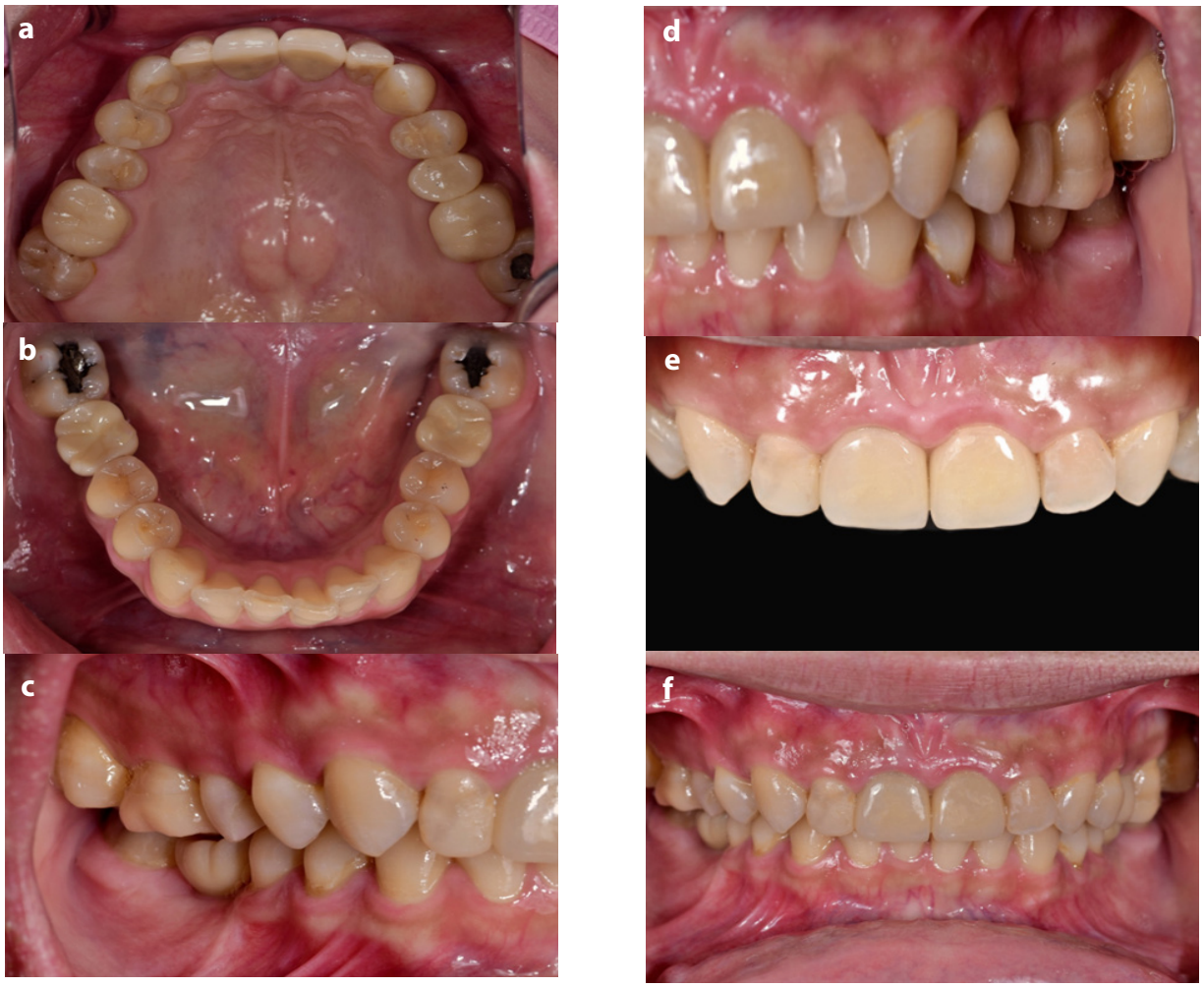


Figure 13: Intraoral post-operative picture. a) maxillary arch b) mandibular arch c) right buccal view d) left buccal view e) frontal view f) area of presenting complaint

Finally, a maintenance phase was established with follow-ups scheduled one week after prosthesis delivery and every six months thereafter.

DISCUSSION

The assessment of tooth restorability is a critical step in treatment planning, particularly for structurally compromised teeth. One of the most vital determinants is the amount of remaining sound tooth structure especially dentin, since it directly influences the success and longevity of the final restoration (Kutesa-Mutebi & Osman, 2004). Clinical evidence suggests that a remaining dentin thickness greater than 1 mm is generally favorable, with the buccal and palatal walls contributing more significantly to the mechanical stability of the restoration compared to the mesial and distal aspects (Stankiewicz & Wilson, 2008). When insufficient coronal structure exists, a post and core restoration may be considered, but only when it can be justified biomechanically and biologically (Bhalla et al., 2020). Periodontal health is integral to successful outcomes; inflammatory changes induced by compromised restorations or microbial invasion can further deteriorate the remaining tooth structure (Kois, 2000). Endodontic considerations are equally significant, particularly in teeth that have undergone or require root canal treatment. A secure apical seal is necessary to prevent reinfection, and the clinician must assess whether additional endodontic intervention

may exacerbate the existing compromise or introduce new risks (Mannocci et al., 2014). Occlusal factors also influence restorability. Functional loading, especially in posterior teeth or those subject to excessive occlusal forces, must be evaluated, as highlighted in a recent study, which emphasizes that occlusal loading on endodontically treated teeth can significantly affect structural integrity (Mazlan et al., 2025). Parafunctional habits like bruxism must be identified and managed, as they impose repetitive stresses that may accelerate failure of both the restoration and the tooth itself (Popescu et al., 2025).

A comprehensive restorability assessment should follow a structured protocol, beginning with the removal of all existing restorations and thorough excavation of caries. This is followed by an evaluation of the periodontal condition and its potential for recovery. Finally, the assessment should consider the tooth's strategic importance, esthetic relevance, and functional role within the occlusal scheme (Adawi & Dewan, 2025). To aid clinicians in making such complex decisions, the Dental Practicality Index (DPI) has recently been introduced as a clinical tool to evaluate the feasibility and prognosis of restorative procedures. The DPI provides a standardized approach to guide treatment decisions, including when to proceed with restoration, when to monitor, and when to refer the patient for specialist care (Dawood & Patel, 2017). This holistic approach ensures that restorability is not judged solely on remaining structure, but also considers biological, functional, and practical clinical parameters.

The placement of crown margins plays a critical role in both periodontal health and restorative success (Nugala et al., 2012). Equigingival margins, which align with the crest of the gingiva, were traditionally discouraged due to concerns over increased plaque accumulation and the potential for gingival inflammation compared to supragingival. Additionally, the possibility of gingival recession exposing the crown margin was seen as an esthetic risk. However, advances in restorative materials and techniques have addressed many of these concerns (Khuller & Sharma, 2009). Today, equigingival margins can be finished to a smooth, polished surface that integrates esthetically and functionally with the tooth, making them more acceptable from a periodontal perspective (Nugala et al., 2012). Studies have shown that both supragingival and equigingival margins are generally well tolerated by the periodontium when executed properly. Equigingival margins pose minimal risk to the biological width when properly placed (Alqahtani et al., 2019). It has been shown that maintaining a 3 mm distance between the preparation margin and the alveolar bone is essential to preserve periodontal health over a period of 4 to 6 months. This 3 mm encompasses approximately 1 mm of supracrestal connective tissue attachment, 1 mm of junctional epithelium, and 1 mm for the gingival sulcus, thereby providing sufficient space for biologic width even when the margin is placed 0.5 mm within the sulcus (Jorgić-Srdjak et al., 2000). In contrast, subgingival margins are more likely to encroach upon the attachment apparatus, potentially triggering inflammation, attachment loss, or gingival recession. Even when not overtly violating the biologic width, subgingival placement may still provoke adverse tissue responses merely due to its subgingival location (Alqahtani et al., 2019). Therefore, equigingival margins, when executed with precision, appropriate contouring, and proper spatial respect for the biologic width, offer a biologically safer and esthetically sound option for crown construction, particularly when subgingival placement is not indicated.

Post and core restorations are often needed for teeth with moderate-to-extensive loss of tooth structure in order to retain the crown. The choice of post depends on the amount of remaining coronal tooth structure (Bhalla et al., 2020). Fibre posts are recommended when there is enough

coronal dentin, while cast posts are suitable for moderate-to-severe tooth structure loss (Bacchi et al., 2013). However, a review of laboratory and clinical studies showed that endodontically treated posterior teeth with limited tissue loss can be restored without posts, especially when total coverage is planned (Aurélio et al., 2016). Another review found insufficient evidence to support or reject the use of posts in cavities without remaining walls and with a circumferential ferrule of 2 mm in height and 1 mm thick. Clinical decision-making should consider factors such as remaining tooth structure, tooth type and position, occlusal and functional requirements, and the type of final restoration (Naumann et al., 2018). In terms of post selection, a recent review and meta-analysis concluded that fibre posts have higher survival rates than metal posts in restoring teeth with no more than two remaining walls (Wang et al., 2019). The current case report chose the fibre post over metal post for the restoration of anterior teeth. This is because fibre posts, with similar elastic moduli to dentin (20 GPa), distribute stress more effectively compared to metal posts (200 GPa), which concentrate stress at the apical region and can lead to root fractures (Rocca & Krejci, 2013).

The choice of final restoration depends on the amount and quality of remaining tooth structure, topography and coronal morphology of the tooth and the functional occlusal forces that the restoration-tooth complex has to withstand (Vârlan et al., 2009). Furthermore, protecting endodontically treated teeth with appropriate prostheses is essential, as they are subjected to higher occlusal forces than vital teeth (Mazlan et al., 2025). The use of partial coverage restorations allows the clinicians to preserve dentin and when this conservation approach is combined with the use of correct adhesive protocols, it can provide long-lasting aesthetic restorative management for ETT (Mannocci et al., 2014). The recommendations for the restoration of endodontically treated anterior teeth are illustrated in Figure 14 which was adapted according to Bhalla et al., 2020.

CONCLUSION

Preserving coronal tooth structure is essential for success, with adhesive dentistry advancements enabling conservative options for ETT. Direct restorations suit minimal tooth loss, while indirect restorations and post and core systems address more extensive loss. Fibre posts are preferred for anterior teeth and adequate dentin, as they better distribute

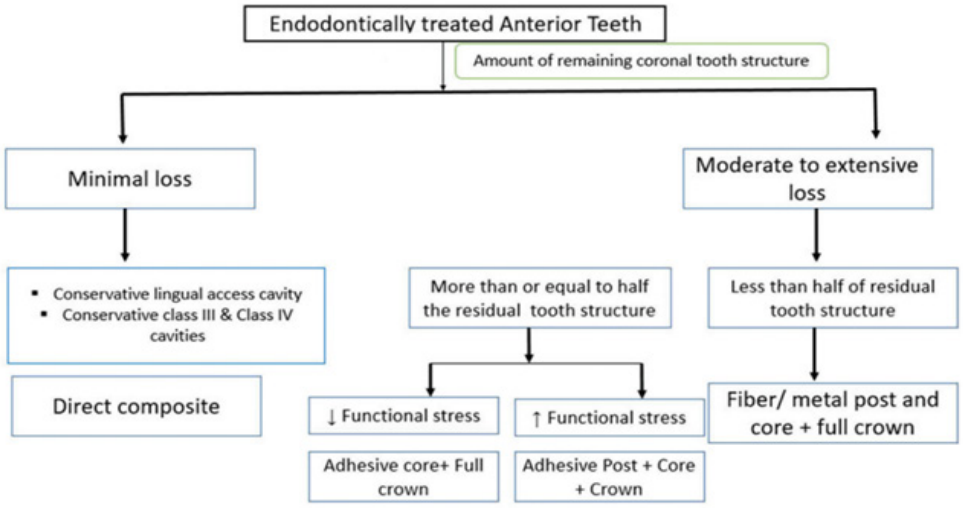


Figure 14: Clinical guidelines for restoring endodontically treated anterior teeth, adapted from "Decision making and restorative planning for adhesively restoring endodontically treated teeth: An update"

stress and reduce fracture risk. Ultimately, the choice of restoration depends on tooth structure, morphology, and function, with partial coverage and proper adhesive protocols offering durable, aesthetic outcomes for ETT.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

CONSENTS

Informed consent was obtained from the patient before preparing this case report.

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