Fracture Management Of Anterior Teeth With Porcelain Fused To Metal (Pfm) Crown: A Case Report

Yasonda Windari, Aditya Ramadhan*, Christina Mahardika***

**Faculty of Dentistry, University of Muhammadiyah Semarang*

***Department of Conservation Dentistry, Faculty of Dentistry, University of Muhammadiyah Semarang*

***Correspondence*: drg.christina@unimus.ac.id**

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ABSTRACT

Background: Traumatic dental injuries (TDIs) are injuries involving hard tissues and/or the periodontium resulting from mechanical trauma. Teeth with pulp inflammation or pulp necrosis require root canal treatment to eliminate bacterial irritants and debride necrotic tissue. Porcelain fused to metal (PFM) material possesses favorable aesthetic properties and enhances long-term fracture resistance of the tooth. To describe the root canal treatment procedure and subsequent placement of a PFM jacket crown for fractured anterior teeth.

Case: A 23-year-old male patient presented to RSGM UNIMUS with a chief complaint of fractured maxillary anterior teeth following a motorcycle accident approximately 10 years prior. The patient reported discoloration of the right anterior tooth. Clinical examination revealed extensive crown structure loss on the maxillary central incisors with fracture extending to the pulp chamber. Radiographic examination demonstrated periapical radiolucent lesions at the apical third of tooth 11 (approximately 2 mm) and tooth 21 (approximately 1–2 cm), with ill-defined and indistinct borders, ovoid shape, and asymmetric appearance.

Management: Root canal treatment was performed over multiple visits. Biomechanical preparation of the root canals was followed by intracanal medication with calcium hydroxide to sterilize the canal system. Obturation was accomplished using gutta-percha and endomethasone-eugenol-based sealer. Post-endodontic restoration included placement of a fiber post to enhance retention, followed by core build-up. The final restoration consisted of a porcelain fused to metal (PFM) jacket crown to restore function and aesthetics. Evaluation at oneweek post-cementation revealed no symptoms, negative percussion response, and stable function, indicating a favorable treatment outcome.

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INTRODUCTION

Traumatic dental injuries (TDIs) are injuries involving hard tissues and/or the periodontium resulting from mechanical trauma. They occur with considerable frequency among preschool children, school-age children, and young adults, constituting approximately 5% of all injuries for which individuals seek medical care.(1)

The maxillary central incisors are the most frequently fractured teeth, followed by the maxillary lateral incisors and mandibular incisors. In addition to causing physical damage, anterior tooth fractures can have significant psychological consequences due to their adverse effect on the patient's aesthetic appearance.(2) Crown or root fractures present three possible outcomes: first, the pulp may heal and remain vital; second, pulp necrosis may occur shortly after the trauma; and third, progressive pulp degeneration may ultimately lead to necrosis.(3)Pulp necrosis represents a condition of pulp cell death. Trauma-induced pulp necrosis may develop within a matter of weeks. The pathophysiological process involves disruption of blood circulation within the pulp, ultimately resulting in necrosis.(4) Dental trauma can cause obstruction of the main apical blood vessels, subsequently leading to dilation of the pulpal capillaries. This capillary dilation is followed by capillary degeneration and pulpal edema. Due to the absence of collateral circulation within the pulp, partial or total ischemic infarction of the pulp may ensue, resulting in a diminished inflammatory response. This creates conditions favorable for bacterial penetration to the small vessels at the apex, ultimately causing pulp necrosis.(5)

Pulp necrosis comprises two types: coagulative necrosis and liquefactive necrosis. In coagulative necrosis, the soluble components of the tissue precipitate or are converted into solid material. Caseous necrosis is a form of coagulative necrosis in which the tissue is transformed into a cheese-like mass consisting of coagulated proteins, lipids, and water. Liquefactive necrosis occurs when proteolytic enzymes convert tissue into a soft mass, liquid, or amorphous debris. Since the pulp is enclosed by rigid walls and lacks collateral circulation, with venules and lymphatics collapsing due to increased tissue pressure, irreversible pulpitis invariably progresses to liquefactive necrosis. If the exudate produced during irreversible pulpitis is absorbed or drained through a carious cavity or exposed pulp into the oral cavity, the necrotic process is delayed, and the radicular pulp may remain vital for a considerable period. Conversely, if the exudate is contained or the inflamed pulp is sealed, rapid and total pulp necrosis and periapical pathosis will ensue.(6)

Teeth with pulp inflammation or pulp necrosis require root canal treatment to eliminate bacterial irritants and debride infected necrotic tissue from the root canal system. Root canal treatment consists of three primary stages: biomechanical preparation (canal shaping), sterilisation (canal cleaning), and obturation (canal filling).(7)

Dental restoration following root canal treatment is performed to restore the aesthetic function of the tooth and serves as a critical determinant of endodontic treatment success. An ideal dental restoration must protect the occlusal surface and missing cusps, thereby maximally safeguarding the remaining crown structure. Various restoration types exist, including rigid and plastic restorations. The selection of an appropriate post-endodontic restoration must account for its indications and the support provided by the tooth and surrounding tissues.(8)

One of the most commonly used definitive restorations following root canal treatment is the *porcelain fused to metal* (PFM) jacket crown, which combines the strength of metal with the aesthetics of porcelain. A PFM crown has a metal substructure as its core framework, providing strength and durability, while the porcelain veneer imparts an

aesthetic appearance resembling natural dentition. This combination makes PFM crowns highly favoured in clinical practice as they can withstand masticatory loads while simultaneously delivering satisfactory aesthetic outcomes.[9] A post, as a component of the restoration, is placed into the root canal to improve retention and resistance. Retention reflects the post's resistance to axial pull-out forces, while factors influencing resistance include post length, post strength, and the amount of remaining tooth structure.[8]

This case report describes the complete treatment sequence from root canal treatment to placement of a porcelain fused to metal (PFM) jacket crown in a patient presenting with fractured anterior teeth.

CASE REPORT

Chief Complaint

A 23-year-old male patient presented to RSGM UNIMUS with a chief complaint of fractured maxillary anterior teeth following a motorcycle accident approximately 10 years prior. The patient reported dark discolouration of the right anterior tooth and experienced discomfort, particularly during mastication.

Subjective Examination

The patient denied pain or thermal sensitivity. Tooth 11 had no previous treatment history, whereas tooth 21 had previously received a restoration by a dentist, which became dislodged following a fall approximately 4 months prior. The patient reported a history of gingival swelling adjacent to tooth 11 approximately 2 weeks prior, which was managed with analgesic medication for 3 days.

The medical history was unremarkable, with no systemic diseases or allergies to medications, food, or temperature. Oral hygiene practices included tooth brushing twice daily — in the morning after breakfast and at night before sleep. The patient expressed a desire for dental treatment to improve self-confidence during social interactions.

Objective Examination

Extraoral examination was unremarkable. Intraoral clinical examination of tooth 11 revealed 2/3 of the crown remaining, with fracture depth reaching the pulp chamber roof, accompanied by tooth discolouration (Figure 1). Vertical and horizontal percussion tests were positive, and palpation was positive. Grade 1 mobility was noted. Pulp vitality testing using chloroethyl (CE) yielded a negative response.

Intraoral clinical examination of tooth 21 revealed 2/3 of the crown remaining, with fracture depth reaching the pulp chamber roof. Vertical and horizontal percussion and palpation tests were negative. Grade 1 mobility was noted. Pulp vitality testing using chloroethyl (CE) yielded a negative response.



(a) (b)

Figure 1. Pre-operative clinical photographs of teeth 11 and 21. (a) labial view (b) palatal view.

Radiographic Examination

Radiographic examination of teeth 11 and 21 revealed an oblique radiolucent line consistent with fracture extending to the pulp chamber, indicating pulp involvement. Both teeth presented with a single straight root and single root canal. The periodontal ligament space was absent and the lamina dura was disrupted at the apical third of the roots. Vertical alveolar bone loss of 2 mm was evident at the mesial and distal aspects of both teeth 11 and 21. A periapical radiolucent lesion was observed at the apical third of tooth 11, with ill-defined and indistinct borders, measuring approximately 2 mm, ovoid in shape, and

asymmetric. For tooth 21, a periapical radiolucent lesion was present at the apical third with ill-defined and indistinct borders, measuring approximately 1–2 cm, ovoid in shape, and asymmetric. Based on radiographic findings, the provisional diagnosis for teeth 11 and 21 was Ellis Class IV fracture with periapical abscess (Figure 2).



Figure 2. Pre-operative periapical radiograph.

Diagnosis and Treatment Plan

Based on subjective, objective, and radiographic findings, the diagnosis for tooth 11 according to the American Association of Endodontists (AAE) was pulp necrosis with chronic apical abscess, with a corresponding ICD-10 diagnosis of K04.1 (pulp necrosis). The diagnosis for tooth 21 was similarly pulp necrosis with chronic apical abscess per AAE classification, with ICD-10 diagnosis K04.1 (pulp necrosis).

The indicated treatment for both teeth was root canal treatment, with placement of a fibre-reinforced composite (FRC) post to provide retention and support for the definitive restoration. The selected definitive restoration was a jacket crown fabricated from porcelain fused to metal material.

Prognosis

The prognosis in this case was classified as *favourable* according to the AAE, considering crown fracture involving exposed pulp in a tooth with completed root development. The periodontal tissues were within normal limits, the patient's general health status was satisfactory as evidenced by denial of systemic diseases and drug allergies and the patient demonstrated cooperative and communicative behaviour.

Case Management

At the first visit, subjective and objective examinations were performed. The patient was informed about the proposed treatment plan and provided with a brief explanation of the procedures, including an estimated treatment duration of approximately 8–10 visits per tooth. Following informed consent, supplementary investigations were conducted, including periapical radiography, and the estimated working length was calculated at 21 mm for both teeth 11 and 21.

At the second visit, the working field was isolated using cotton rolls. Open access cavity preparation of tooth 11 was commenced from the palatal surface, extending distally, using an endoaccess bur until penetration into the pulp chamber (Figure 3a). Removal of carious tissue and smoothing of the fractured crown margins were performed using round and fissure diamond burs. Root canal negotiation was performed with K-file #10 to the estimated working length, followed by extirpation of necrotic pulp tissue using a barbed broach inserted to two-thirds of the working length with 180° clockwise rotation and withdrawal. Irrigation was performed using 2.5% sodium hypochlorite (NaOCl) followed by rinsing with 0.9% sodium chloride (NaCl). Determination of the initial apical file (IAF) began with K-file #15 until tugback (apical-third resistance) was achieved at K-file #30. Working length confirmation using an electronic apex locator indicated a working length of 21 mm, subsequently verified by periapical radiography (Figure 3b). The root canal was irrigated with NaCl 0.9%, dried with paper points, a cotton pellet moistened with eugenol was placed in the pulp chamber, and the access cavity was sealed with Cavit temporary restorative material.



(a)



(b)

Figure 3. Second visit. (a) open access of tooth 11, (b) Working length radiograph of tooth 11.

At the third visit, biomechanical preparation and intracanal medication of tooth 11 were performed. The temporary restoration was first removed using an ultrasonic scaler, followed by irrigation with NaCl 0.9%. Biomechanical preparation was performed using the step-back technique, commencing with the IAF (K-file #30) using a watch-winding motion of 60°–90° clockwise and counterclockwise before withdrawal. The IAF was used for apical-third preparation. Irrigation was performed at each file change using EDTA 17%, NaCl 0.9%, and NaOCl 2.5%. Preparation was considered complete upon the appearance of white dentinal shavings and identification of the master apical file (MAF). Preparation of the middle and coronal thirds was accomplished by reducing the working length by 1 mm with each successive K-file number up to 3 sizes above the MAF using watch-winding motion. Recapitulation was performed with K-file #45 at a working length of 21 mm. Canal wall refinement was completed with H-file #45, followed by irrigation with NaCl 0.9% and drying with paper points. Intracanal medication was then placed by mixing $Ca(OH)_2$ with glycerine to a paste consistency, applied using a lentulo spiral, and the access cavity was sealed with temporary restorative material. The medication was maintained for 10–14 days.

At the fourth visit, obturation of tooth 11 with gutta-percha was performed. The temporary restoration was removed and the canal irrigated with NaCl 0.9%. The dressing material was removed from the root canal using H-file at working length and MAF size (#45, working length 21 mm), followed by re-irrigation with NaCl 0.9% and drying with paper points. Clinical evaluation revealed no symptoms, negative percussion response, and an intact temporary restoration without leakage. Paper point inspection showed no colour change or odour.

Master gutta-percha cone trial was performed at working length 21 mm and MAF (#45), and a periapical radiograph was taken (Figure 4a). Root canal obturation was performed using the lateral condensation technique. Sealer was prepared by mixing endomethasone powder with eugenol. The sealer was applied to the canal walls using a lentulo spiral and also to the master gutta-percha cone. The master cone was inserted to the working length and condensed laterally using a spreader #40. Accessory gutta-percha cones were placed until the remaining canal space was completely filled. The gutta-percha was then seared off 2 mm below the orifice using a heated plugger (Figure 4b). A cotton pellet and zinc phosphate were applied. Post-procedure instructions were given, including avoidance of hard and sticky foods, maintenance of oral hygiene, and scheduling of a follow-up visit in 1–2 weeks.



(a)



(b)

Figure 4. Fouth visit. (a) Master cone trial radiograph of tooth 11. (b) Gutta-percha sear-off of tooth 11.

At the fifth visit (Figures 5a and 5b), post-obturation evaluation of tooth 11 was conducted, including subjective, objective, and periapical radiographic examinations. Alginate impressions were taken, occlusal registration was recorded with red wax, and shade selection was performed using a VITA shade guide. Hermetic obturation was confirmed; the patient was scheduled for post cementation followed by jacket crown fabrication.



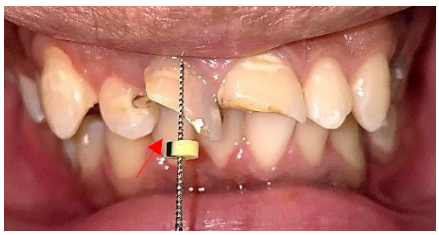
(a)



(b)

Figure 5. Fifth visit. (a) Post-obturation periapical radiograph of tooth 11. (b) Shade selection for tooth 11.

At the sixth visit (Figure 6), crown measurements of tooth 11 were recorded prior to preparation and a gingival retraction cord was placed at the cervical gingival margin to retract the gingival tissue. Tooth preparation was performed on the proximal, labial, and palatal surfaces with a chamfer finishing line. Remaining crown measurements were recorded after preparation (Figure 6b). A provisional crown was cemented using zinc phosphate cement.



(a)



(b)

Figure 6. Sixth visit. (a) Crown measurements before preparation of tooth 11. (b) Crown measurements after preparation of tooth 11.

At the seventh visit, gutta-percha reduction of tooth 11 was performed using a Gates Glidden

drill to the predetermined post space length of 14.5 mm. A fibre-reinforced composite (FRC) post try-in was performed and a periapical radiograph was taken to evaluate the remaining gutta-percha (Figures 7a and 7b). The cavity was sealed with zinc phosphate and a provisional crown.



(a)



(b)

Figure 7. Seventh visit, post try-in for tooth 11. (a) Clinical view. (b) Periapical radiograph.

At the eighth visit (Figure 8), FRC post cementation and core build-up of tooth 11 were performed. The FRC post was cemented using dual-cure resin cement. Core build-up was accomplished using packable composite resin shade A3 on the mesial, distal, labial, and palatal aspects. A double impression using elastomeric impression material with a one-step technique was taken to fabricate a working model for jacket crown construction. A provisional crown was cemented using zinc phosphate cement.



(a)



(b)

Figure 8. Eighth visit, core build-up of tooth 11. (a) Labial aspect. (b) Palatal aspect.

At the ninth visit, cementation of the PFM jacket crown for tooth 11 was performed using Type I GIC luting cement (Figure 9). Occlusion, inclination, width and length, colour, and marginal fit were evaluated. Post-procedure instructions were given and the patient was scheduled for a one-week recall. At the recall visit, the patient had successfully adapted to the restoration.



(a) (b)

Figure 9. Ninth visit, PFM jacket crown cementation of tooth 11. (a) Labial view. (b) Palatal view.

At the tenth visit, open access cavity preparation of tooth 21 was performed. The working field was isolated using cotton rolls. Cavity preparation was commenced from the palatal surface using an endoaccess bur until penetration into the pulp chamber (Figure 10a). Removal of carious tissue and smoothing of the fractured crown margins were performed using round and fissure diamond burs. Root canal negotiation was performed with K-file #10 to the estimated working length, followed by extirpation of necrotic pulp tissue using a barbed broach inserted to two-thirds of the working length with 180° clockwise rotation

and withdrawal. Irrigation was performed using NaOCl 2.5% followed by rinsing with NaCl 0.9%. The IAF was determined commencing with K-file #15 until tugback was achieved at K-file #30. Working length confirmation using an electronic apex locator indicated a working length of 21 mm, verified by periapical radiography (Figure 10b). The root canal was irrigated with NaCl 0.9%, dried with paper points, a cotton pellet moistened with eugenol was placed in the pulp chamber, and the access cavity was sealed with Cavit.



(a)



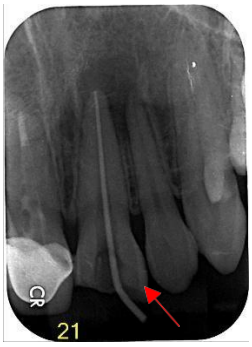
(b)

Figure 10. Tenth visit. (a) Open access cavity of tooth 21, (b) Working length radiograph of tooth 21.

At the eleventh visit, biomechanical preparation and intracanal medication of tooth 21 were performed following the same protocol as tooth 11: step-back technique commencing with IAF (K-file #30) using watch-winding motion of 60°–90°, with irrigation at each file change using EDTA 17%, NaCl 0.9%, and NaOCl 2.5%. The MAF was K-file #45 at a working length of 21 mm. Canal wall refinement was performed with H-file #45, followed by irrigation with NaCl 0.9% and drying with paper points. Intracanal medication $Ca(OH)_2$ mixed with glycerine to paste consistency was applied using a lentulo spiral and sealed with temporary restorative material for 10–14 days.

At the twelfth visit, obturation of tooth 21 with gutta-percha was performed. The temporary restoration was removed and the canal irrigated with NaCl 0.9%. Dressing material was removed using H-file at working length and MAF size (#45, working length 21 mm), followed by re-irrigation with NaCl 0.9% and drying with paper points. Clinical evaluation revealed no symptoms, negative percussion, and an intact temporary restoration without leakage. Paper point inspection showed no colour change or odour.

Master gutta-percha cone trial was performed at working length 21 mm and MAF (#45), with periapical radiography (Figure 11a). Obturation was performed by the lateral condensation technique with endomethasone–eugenol sealer applied to the canal walls and master cone via lentulo spiral. The master cone was inserted to the working length and condensed laterally with spreader #40. Accessory cones were placed until the canal was completely filled. The gutta-percha was seared off 2 mm below the orifice using a heated plugger (Figure 11b). A cotton pellet and zinc phosphate were applied. Post-procedure instructions were given and a follow-up visit was scheduled in 1–2 weeks.



(a)



(b)

Figure 11. Twelfth visit. (a) Master cone trail of tooth 21. (b) Gutta-percha sear-off of tooth 21.

At the thirteenth visit (Figures 12a and 12b), post-obturation evaluation of tooth 21 was conducted, including subjective, objective, and periapical radiographic examinations. Alginate impressions were taken, occlusal registration was recorded with red wax, and shade selection was performed using a VITA shade guide. Hermetic obturation was confirmed; the patient was scheduled for post cementation followed by jacket crown fabrication.



(a)

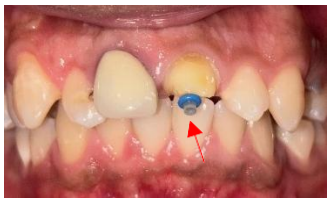


(b)

Figure 12. Thirteenth visit. (a) Post-obturation periapical radiograph of tooth 21. (b) Shade selesction for tooth 21.

At the fourteenth visit, crown measurements of tooth 21 were recorded prior to preparation and a gingival retraction cord was placed at the cervical gingival margin. Tooth preparation was performed on the proximal, labial, and palatal surfaces with a chamfer finishing line. Remaining crown measurements were recorded after preparation. A provisional crown was cemented using zinc phosphate cement.

At the fifteenth visit, gutta-percha reduction of tooth 21 was performed using a Gates Glidden drill to the predetermined post space length of 18 mm. An FRC post try-in was performed and a periapical radiograph was taken to evaluate the remaining gutta-percha (Figures 13a and 13b). The cavity was sealed with zinc phosphate and a provisional crown.



(a)



(b)

Figure 13. Fifteenth visit, post try-in for tooth 21. (a) Clinical view. (b) Periapical radiograph.

At the sixteenth visit (Figure 14), FRC post cementation and core build-up of tooth 21 were performed. The FRC post was cemented using dual-cure resin cement. Core build-up was accomplished using packable composite resin shade A3 on the mesial, distal, labial, and palatal

aspects. A double impression using elastomeric impression material with a one-step technique was taken to fabricate a working model for jacket crown construction. A provisional crown was cemented using zinc phosphate cement.



(a)



(b)

Figure 14. Sixteenth visit, core build-up of tooth 21. (a) Labial view. (b) Palatal view.

At the seventeenth visit, cementation of the PFM jacket crown for tooth 21 was performed using Type I GIC luting cement (Figure 15). Occlusion, inclination, width and length, colour, and marginal fit were evaluated. Post-procedure instructions were given and the patient was scheduled for a one-week recall. At the recall visit, the patient had successfully adapted to the restoration.



(a) (b)



(c) (d)

Figure 15. Seventeenth visit, PFM jacket crown cementation of tooth 21. (a) Labial view. (b) and (c) Lateral views. (d) Palatal view.

DISCUSSION

Trauma-induced dental fractures represent a common presentation in clinical dentistry. Dental trauma can cause obstruction of the main apical blood vessels, subsequently leading to dilation of the pulpal capillaries. This capillary dilation is followed by capillary degeneration and pulpal oedema. Due to the absence of collateral circulation within the pulp, partial or total ischaemic infarction may ensue, resulting in a diminished inflammatory response. This allows bacterial penetration to the small apical vessels, and collectively these events can result in pulp necrosis.[1]

The objective of endodontic treatment is to preserve the tooth in functional service within the dental arch. This goal is achievable when treatment is carried out according to the *endodontic triad*: *access opening*, *cleaning and shaping*, and *filling*.[10] Root canal instrumentation is preceded by correct access cavity preparation, enabling the shaping stage to produce a canal form that is amenable to effective cleaning and hermetic obturation.[11]

The initial stage of root canal preparation uses the step-back technique, progressing from the apex toward the coronal portion. This technique achieves satisfactory canal tapering with a low risk of perforation and step formation. Limitations include the tendency of instruments to bind and fracture in narrow canals, difficulty achieving adequate apical debridement through irrigation, longer procedural time, and greater instrumentation requirements.[12]

The irrigant employed in this case was 2.5% NaOCl. The role of irrigating solutions in root canal debridement is paramount. NaOCl is capable

of cleaning the prepared root canal system, dissolving dentinal debris and pulp tissue, and exhibiting antimicrobial activity, as well as serving as a lubricant. NaOCl remains the irrigant of choice in endodontic treatment; it is used at concentrations of 0.5–5.25%, with 2.5% NaOCl employed in this case. NaOCl is an effective antimicrobial agent capable of eliminating *Enterococcus*, *Actinomyces*, *C. albicans*, and other microorganisms that are difficult to eradicate from root canals.(13)

Calcium hydroxide has long been recognised as one of the most effective intracanal dressing materials. Its mechanism of action involves the release of Ca^{2+} ions, which participate in tissue mineralisation, and OH^- ions, which exert antimicrobial effects through pH elevation, creating an alkaline environment that most root canal microorganisms cannot withstand. Calcium hydroxide can destroy residual necrotic tissue and bacteria along with their by-products due to its antimicrobial effect at high pH (>12), non-rapid setting properties, insolubility in alcohol, ease of removal, and radiopacity.(1)

The obturating material of choice remains gutta-percha, which must be used in combination with a root canal sealer. The primary function of the sealer is to fill voids between the gutta-percha and canal walls in both the apical and lateral directions, thereby preventing apical leakage. Gutta-percha is the solid obturation material of choice, demonstrating minimal toxicity and minimal tissue irritation. Its advantages include compressibility, biocompatibility, dimensional stability, tissue adaptability, radiographic radiopacity, and thermoplasticity when heated.(14)

The success of root canal treatment represents the achievement of treatment according to predetermined criteria. In general, root canal treatment is considered successful when the patient is asymptomatic and the tooth is functional. General success criteria include absence of pain or swelling in the treated tooth, absence of clinical signs and symptoms with the tooth restored to physiological function, and a normal periapical radiographic appearance.(15) Radiographic success is indicated by the absence of radiolucent areas at the obturated canal. Voids or radiolucent areas within the obturated canal indicate incomplete obturation.(16)

In this case, a full-coverage *porcelain fused to metal* (PFM) crown was selected as the definitive restoration. The PFM crown represents an optimal choice when taking various factors into consideration, including financial aspects. Among the disadvantages of PFM crowns is the optical characteristic that the translucency of a PFM crown does not replicate that of a vital tooth; the crown tends to appear more prominent because its labial surface reflects more light than it transmits. PFM restorations demonstrate long-term durability and are rarely associated with clinical complaints.(17)

In this case, the patient denied pain or sensitivity at the 1- and 2-week post-obturation observation visits, confirming that endomethasone sealer is safe for use as a root canal obturating material. The patient reported improved speech clarity (phonation), particularly for the pronunciation of consonants f, v, t, and s, which require contact of the maxillary anterior teeth. Furthermore, the patient reported no longer feeling self-conscious during social interactions, reflecting an improvement in self-confidence.

CONCLUSION

Root canal treatment and jacket crown restoration using a fibre post were performed for fracture cases involving exposed pulp and periapical abscess of teeth 11 and 21. The intracanal medication employed was calcium hydroxide, whose alkaline pH provides a bactericidal effect essential for managing periapical

tissue infection. The irrigating solution of 2.5% NaOCl demonstrated successful microorganism elimination, as evidenced by the absence of subjective and objective symptoms. These procedures ensured root canal treatment success according to its established criteria: absence of pain, radiographic evidence of hermetically obturated canals without periapical inflammation, and a clinically functional outcome.

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