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Comprehensive Prosthodontic Rehabilitation In A Patient With Partial Edentulism And Dental Fluorosis

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Abstract

Posterior tooth loss may impair mastication, alter occlusal load distribution, and disrupt dental arch continuity. Dental fluorosis complicates restorative planning due to altered tooth color and opacity. This report describes prosthodontic rehabilitation in a patient with dental fluorosis and partial edentulism using a fixed dental prosthesis. A 19-year-old male presented with esthetic concerns following extraction of tooth 34 four months earlier. Examination showed an edentulous area at tooth 34, with an alveolar ridge and no bone resorption. Teeth 33 and 35 had healthy periodontal tissues, and generalized fluorosis affected all teeth. Radiographs showed no periodontal ligament widening or alveolar bone resorption around the abutments. Their root surface areas satisfied Ante's law; therefore, teeth 33 and 35 were suitable abutments. Tooth 34 was replaced with a porcelain-fused-to-metal fixed-fixed bridge featuring a modified ridge-lap pontic, rigid connectors, and full-crown extracoronal retainers. Pontic shade selection was performed before preparation, considering tooth shade, fluorosis-related opacity, hydration, and harmony with adjacent teeth. The prosthesis provided retention and restored mastication, esthetics, and dental arch continuity. Bridge rehabilitation in patients with dental fluorosis requires assessment of abutments and supporting tissues, together with careful shade selection, to achieve functional and esthetic outcomes.

Keywords: Dental Fluorosis; Fixed Dental Prosthesis; Tooth Loss; Porcelain-Fused-To-Metal (PFM).

INTRODUCTION

Tooth loss is a common problem in dentistry that may result from various factors, including dental caries, periodontal disease, trauma, and failure of previous dental treatments. The loss of one or more teeth, particularly in the posterior region, can adversely affect the function of the stomatognathic system. Posterior teeth play an important role in mastication by bearing and distributing occlusal forces (Friel & Waia, 2020). Consequently, posterior tooth loss may reduce masticatory efficiency and alter occlusal force distribution. In addition to functional impairment, tooth loss that is not promptly rehabilitated may result in positional changes in adjacent and opposing teeth, such as tipping, drifting, and extrusion, which may ultimately affect occlusal relationships and dental arch stability (Akl & Stendahl, 2022).

Furthermore, tooth loss may disrupt the balance among the teeth, periodontal tissues, masticatory muscles, and temporomandibular joints. The edentulous space may undergo dimensional changes if the missing tooth is not replaced promptly. Such changes may complicate subsequent prosthodontic treatment due to reduced restorative space and altered occlusal relationships (Shafiq & Yazdanie, 2022). In certain cases, patients with unreplaced posterior tooth loss may compensate during mastication by predominantly chewing on the contralateral side. This habit may alter masticatory patterns and the distribution of occlusal forces on the remaining teeth. Therefore, replacing missing teeth is essential for maintaining function, dental arch continuity, and occlusal balance (Yoshimoto et al., 2023).

A fixed dental prosthesis (FDP), commonly known as a dental bridge, is one treatment option for replacing missing teeth. An FDP can restore masticatory function and help maintain occlusal relationships by replacing missing teeth using abutment teeth located mesial and distal to the edentulous area. Treatment success is influenced by several factors, including periodontal health, the quality and quantity of abutment tooth structure, occlusal relationships, prosthesis design, material selection, and appropriate clinical techniques

(Fitria et al., 2022). A comprehensive assessment of the abutment teeth is also necessary during treatment planning, particularly when dental fluorosis is present. Dental fluorosis is a developmental enamel defect caused by excessive fluoride exposure during tooth formation (Alwadai et al., 2025). Clinically, fluorosis may manifest as changes in enamel color and opacity, white lines or patches, and structural alterations in more severe cases. These manifestations should be considered during clinical assessment because changes in enamel structure and surface characteristics may influence restorative considerations, particularly when fluorosed teeth are used as abutments in prosthodontic rehabilitation (Harun Achmad et al., 2021)

Treatment planning for patients presenting with tooth loss accompanied by dental fluorosis requires comprehensive clinical examination and careful consideration. Evaluation of abutment tooth conditions, periodontal tissues, occlusal relationships, edentulous space, and dental structure is necessary to determine the suitability of an FDP. Appropriate treatment planning is expected to provide a restoration that restores masticatory function while preserving the health of supporting tissues and maintaining occlusal stability (Hosney et al., 2022). This case report aims to describe the prosthodontic management of tooth loss using an FDP in a patient with dental fluorosis, with particular emphasis on the clinical condition of the abutment teeth, occlusal relationships, and the principles of prosthodontic treatment planning.

Case Report

A 19-year-old male patient presented with a chief complaint of reduced self-confidence due to the loss of a lower left posterior tooth. The tooth had been extracted approximately four months prior to presentation. The patient had no history of systemic diseases or allergies to food, medications, or environmental factors. He reported brushing his teeth twice daily, in the morning and evening while bathing. His dietary habits included regular consumption of tea, coffee, and sugary foods. The patient's family medical history revealed no systemic diseases in either parent.

Extraoral examination revealed a good general condition, a symmetrical face, and no apparent abnormalities. Intraoral examination revealed an edentulous area at tooth 34, bounded by tooth 33 mesially and tooth 35 distally (Figure 1). Clinical examination showed that the alveolar ridge in the edentulous area was classified as Class I according to Nallaswamy's classification, with a relatively rounded contour. Palpation revealed no tenderness or palpable abnormalities. The mucosa in the edentulous area appeared pink to reddish, with a relatively intact surface and no apparent ulceration. The mucosal consistency was firm and resilient, without flabby tissue. Overall, the supporting tissues in the edentulous area were considered clinically satisfactory, with no evident pathological changes.

Clinical examination of the dentition revealed generalized changes in enamel color and opacity, characterized by diffuse white spots affecting the tooth surfaces, suggestive of dental fluorosis. The teeth remained structurally intact, with no loss of coronal structure. Pulp vitality testing yielded positive responses, indicating that the teeth remained vital. Periodontal examination of the proposed abutment teeth revealed pink gingiva with firm consistency and normal stippling. Palpation revealed no tenderness or swelling, and there were no signs of inflammation, such as excessive redness or gingival enlargement. Overall, the periodontal condition of the proposed abutment teeth was considered healthy and suitable for fixed dental prosthesis treatment.



Figure 1. Intraoral condition of the patient.

A panoramic radiograph was obtained to evaluate the dentition, periodontal tissues, alveolar bone, and root conditions of the teeth proposed as abutments (Figure 2). Radiographic examination was performed to assess the supporting tissues and evaluate the root surface areas of teeth 33 and 35 as part of the assessment of their suitability for fixed dental prosthesis treatment. Abutment selection was evaluated based on Ante's law, which states that the combined root surface area of the abutment teeth should be equal to or greater than that of the teeth being replaced. Radiographic findings revealed that teeth 33 and 35 had relatively thick and long roots with adequate root surface areas. The combined root surface area of both proposed abutment teeth was considered greater than that of the missing tooth 34. Furthermore, no significant pathological changes were observed in the proposed abutment teeth, and no significant alveolar bone resorption was evident in the edentulous area.



Figure 2. Panoramic radiograph of the patient.

Based on the clinical and radiographic findings, the diagnosis was partial edentulism involving tooth 34 in the left posterior mandibular region. Teeth 33 and 35 were selected as abutment teeth because they exhibited adequate clinical and radiographic conditions, with no anomalies or malpositioning, and had sufficient root surface areas according to Ante's law. Accordingly, a fixed dental prosthesis was planned to replace the missing tooth 34. The treatment aimed to restore the missing tooth, improve masticatory function, maintain dental arch continuity, and help prevent positional changes in adjacent and opposing teeth following tooth loss.

The planned prosthesis was a fixed-fixed bridge, with teeth 33 and 35 serving as abutments and tooth 34 as the pontic. A porcelain-fused-to-metal (PFM) restoration was selected, featuring full-crown extracoronal retainers on teeth 33 and 35. A modified ridge-lap pontic and rigid connectors were incorporated into the prosthesis design. This design was selected to provide adequate retention and resistance through the two abutment teeth while replacing the missing tooth 34. The modified ridge-lap pontic was also chosen to facilitate oral hygiene maintenance by allowing access for cleaning beneath the pontic. PFM was selected as the restorative material considering the functional demands of the posterior

region, particularly its ability to withstand masticatory forces while providing a restoration with a tooth-like anatomical appearance.

Case Management

The treatment began with the fabrication of preliminary study casts using a No. 2 perforated stock tray and alginate (irreversible hydrocolloid) impression material with a mucostatic impression technique (Figure 3). The impressions were subsequently poured with dental stone to obtain study casts, accompanied by an occlusal record (bite record) to guide the determination of the maxillomandibular relationship and prosthesis arrangement. The study casts were used to analyze the dental condition, edentulous space, abutment tooth positions, and the proposed fixed dental prosthesis design. Based on the evaluation, a fixed dental prosthesis was planned for the 33–35 region, with teeth 33 and 35 serving as abutments and tooth 34 as the pontic. The planned design was a fixed-fixed bridge made of porcelain-fused-to-metal (PFM), incorporating a modified ridge-lap pontic, rigid connectors, and full-crown extracoronal retainers on teeth 33 and 35. The fluorotic areas on the labial and buccal surfaces of the abutment teeth were addressed through full-crown extracoronal preparation, which also aimed to improve the overall esthetic appearance of the restoration.



Figure 3. Study cast impression.

The provisional restoration was fabricated from the study cast before tooth preparation. A provisional pontic was first constructed using red modeling wax according to the anatomical contour and planned bridge design. The wax-up was then duplicated using putty impression material to obtain a negative impression, referred to as the interim index. Following preparation of the abutment teeth, an impression was made using putty material and poured with Type IV dental stone to obtain a positive cast.

The interim index was filled with self-curing white acrylic resin, while the positive cast was coated with cold mold seal (CMS), which served as a separating medium to prevent the acrylic resin from adhering to the gypsum cast. The positive cast was then seated into the interim index. Excess self-curing white acrylic resin was removed, and the material was allowed to polymerize until the provisional restoration was obtained. The provisional restoration was fabricated to protect the prepared teeth and prevent tooth migration or positional changes during the fabrication of the definitive prosthesis.

At the second visit, shade selection and preparation of the abutment teeth (33 and 35) were performed. Shade selection was carried out using a shade guide before tooth preparation to minimize potential color perception changes caused by tooth dehydration. The shade was selected by determining the most appropriate value, chroma, and hue to match the patient's natural dentition. In this patient with dental fluorosis, shade selection also considered the altered enamel color and opacity to achieve harmony between the definitive prosthesis and the adjacent teeth. Shade selection was performed under appropriate lighting conditions, preferably standardized daylight illumination, while avoiding brightly colored objects near the area of shade assessment.

Tooth preparation was performed on teeth 33 and 35 for full-crown extracoronal retainers. Gingival retraction was performed using retraction cords impregnated with epinephrine to obtain adequate access and visibility of the cervical preparation margins. Guiding grooves were prepared on the incisal and occlusal surfaces to establish the desired reduction depth of approximately 1.5–2 mm using a wheel diamond bur. Reduction was performed incrementally, following the anatomical contours of the teeth while preserving as much sound tooth structure as possible. Proximal surfaces were prepared using a round-end tapered fissure diamond bur until adequate clearance from adjacent teeth was achieved and the preparation walls exhibited convergence toward the occlusal surface. Labial surface reduction was performed by creating guiding grooves and reducing the tooth structure by approximately 1–1.5 mm using a round-end fissure diamond bur to provide sufficient restorative space. Cervical preparation was performed using a round-end fissure diamond bur to establish a circumferential deep chamfer finish line extending slightly subgingivally. Sharp edges and line angles were rounded using a round-end tapered diamond bur. Final finishing and polishing were performed using finishing burs and sandpaper discs to obtain smooth preparation surfaces and eliminate undercuts and sharp angles. The final preparations were evaluated to ensure adequate restorative space, appropriate retention and resistance form, and continuous finish lines (Figure 4).

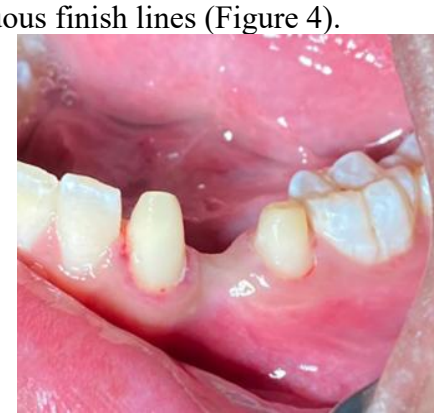


Figure 4. Prepared abutment teeth.

The provisional restorations were fabricated directly using the previously prepared putty interim index and cemented with zinc phosphate cement. Occlusion was subsequently evaluated using articulating paper. Final impressions were then made to obtain working casts for the laboratory fabrication of the definitive fixed dental prosthesis. The working area was cleaned, and prophylaxis was performed. Gingival retraction was subsequently carried out on teeth 33 and 35 using retraction cords impregnated with epinephrine to obtain clear visibility of the preparation margins. The abutment teeth were cleaned and dried before impression making. Final impressions were obtained using a perforated stock tray and elastomeric impression materials, consisting of putty as the heavy-body material and light-body material as the wash material.

The putty material was mixed until homogeneous, placed in the impression tray, and used to make an impression of the 33–35 region. After the material had set, the impression was removed, and the areas requiring additional space for the light-body material were relieved. The light-body material was then applied around the prepared abutment teeth, and the tray was repositioned intraorally until the material had completely set. The final impression was evaluated to ensure that all preparation details, particularly the finish lines, had been accurately recorded (Figure 5). The impression was subsequently poured with dental stone to obtain the working cast. The patient's occlusal relationship was recorded using a bite registration material, and the working casts were mounted on an articulator as a basis for laboratory processing.



Figure 5. Final working impression.

At the third visit, a coping try-in of the fixed dental prosthesis was performed. The provisional restorations were first removed, and the abutment teeth were cleaned. The metal copings were then placed intraorally to evaluate retention, stability, marginal adaptation, proximal contacts, relationships with the periodontal tissues, and occlusal relationships with the opposing teeth. Occlusal contacts were examined using articulating paper to identify any premature contacts or occlusal trauma. Selective occlusal adjustments were performed when excessive contacts were identified. Proximal contacts were evaluated to ensure that the restoration could be properly seated without exerting excessive pressure on the adjacent teeth. Cervical adaptation was also examined to ensure that the restoration margins were appropriately positioned without causing irritation to the periodontal tissues. The fixed dental prosthesis was temporarily cemented using temporary cement during the patient's adaptation period before definitive cementation.

At the fourth visit, subjective and objective evaluations were performed to assess the patient's adaptation to the fixed dental prosthesis during the provisional cementation period. The patient was asked about any complaints, including pain, discomfort, difficulty during mastication, or irritation of the tissues surrounding the restoration. When no complaints were reported and objective examination revealed satisfactory conditions, definitive insertion of the fixed dental prosthesis was performed (Figure 6). The abutment teeth were cleaned, dried, and isolated from saliva. Type I glass ionomer cement was mixed according to the manufacturer's instructions using an agate spatula on a paper mixing pad until the appropriate consistency was achieved. The cement was evenly applied to the internal surfaces of the retainers. Following definitive cementation, the stability, retention, and occlusion of the prosthesis were evaluated.



Figure 6. Definitive insertion of the fixed dental prosthesis.

Retention was evaluated to ensure that the restoration remained securely in position against dislodging forces acting in the direction opposite to its path of insertion. Stability was assessed by confirming that the prosthesis did not exhibit movement during functional activities, including mastication, swallowing, and speaking. Occlusal examination was performed in centric occlusion and during mandibular movements to ensure the absence of

premature contacts or interferences that could impose excessive forces on the restoration or abutment teeth. The patient received instructions on maintaining oral hygiene, particularly in the areas beneath the pontic and around the abutment teeth. The patient was advised to avoid excessively hard foods during the initial period of prosthesis use and to maintain interdental hygiene using appropriate cleaning aids. Further instructions regarding prosthesis maintenance and the importance of regular follow-up visits were also provided.

At the fifth visit, a post-insertion follow-up examination was performed to evaluate the patient's adaptation to the fixed dental prosthesis. Subjective evaluation involved asking about any complaints following prosthesis placement, such as pain, a sensation of bulkiness, masticatory difficulties, or discomfort. Objective examination included assessment of the soft tissues and periodontal tissues surrounding the abutment teeth and pontic, as well as evaluation of prosthesis retention, stability, marginal adaptation, and occlusion. The patient's oral hygiene was also assessed to ensure the absence of plaque accumulation or residual cement around the cervical and interproximal areas. The patient received further instructions regarding oral hygiene maintenance for the fixed dental prosthesis and was advised to attend regular follow-up appointments. Subsequent evaluations were planned to ensure that the function, comfort, periodontal health, and stability of the restoration were maintained. Further follow-up examinations were scheduled every six months, with radiographic assessments performed as clinically indicated to evaluate the condition of the abutment teeth and periapical tissues.

Discussion

A fixed dental prosthesis (FDP), commonly known as a dental bridge, is a type of dental restoration used to replace one or more missing teeth by utilizing the teeth adjacent to the edentulous space as abutments. An FDP consists of three main components: retainers, pontics, and connectors, which function as an integrated unit to restore oral function, dental arch continuity, and esthetics. The selection of an FDP as a treatment option for tooth loss requires consideration of several factors, including the condition of the abutment teeth, periodontal health, the length of the edentulous span, occlusal relationships, and the patient's functional and esthetic needs (Prihandaru & Oetami, 2026). The primary objectives of FDP treatment are to restore masticatory and speech functions, improve appearance, prevent tooth migration, maintain facial structure, and enhance patient self-confidence (Sushera & Oetami, 2025).

The presence of dental fluorosis in this patient required special consideration during FDP treatment planning, particularly regarding esthetics and shade selection. Dental fluorosis may cause enamel alterations characterized by varying degrees of opacity and discoloration. These changes may result in heterogeneous tooth coloration, making restorative shade selection more challenging than in teeth with relatively uniform coloration. Therefore, the overall fluorosis characteristics of the patient's dentition should be carefully assessed to ensure that the restoration does not merely match a specific area but achieves color harmony with the abutment teeth and adjacent dentition (Karray et al., 2024). In this case, FDP shade selection was performed before abutment tooth preparation. Preoperative shade selection is important because tooth preparation involves the reduction of enamel and dentin, which may affect the perception of tooth color. Furthermore, teeth may appear whiter following dehydration during clinical procedures, potentially resulting in inaccurate shade selection. Therefore, shade selection was performed while the teeth were clean and hydrated, before any preparation procedures. The natural tooth color was then compared with the shade guide under appropriate lighting conditions. The assessment was also performed within a relatively short period to minimize the influence of visual fatigue on color perception (Alnusayri et al., 2022).

In patients with dental fluorosis, shade selection should not be based solely on the underlying tooth color. Enamel opacity, color intensity, and the distribution of fluorosis-related discoloration should also be considered. If the restoration shade is selected solely to match the whitest areas of the enamel, the restoration may appear excessively bright compared with the adjacent teeth. Conversely, matching only the darker areas may result in a restoration that appears too dark (Guyonvarch et al., 2025). Therefore, shade selection should consider the predominant overall tooth color and its compatibility with teeth 33 and 35 as the abutments, as well as the surrounding dentition. Shade matching involves three principal color dimensions: hue, chroma, and value. Regarding hue, natural tooth color is generally dominated by yellow to reddish-yellow tones, which can be reproduced by selecting a porcelain shade that closely resembles the natural dentition. In terms of chroma, color intensity is generally higher in the cervical region than in the middle and incisal regions. Accordingly, the cervical portion may be characterized by greater saturation, gradually decreasing toward the incisal region. Regarding value, the cervical region generally exhibits lower brightness, whereas the middle and incisal regions may demonstrate higher brightness, depending on the translucency and optical characteristics of the teeth. Therefore, preoperative shade selection that considers the predominant tooth color, fluorosis-related opacity, tooth hydration, and compatibility with adjacent teeth is an essential step in achieving functional and esthetic FDP outcomes (Alnusayri et al., 2022).

In this case, clinical examination revealed dental fluorosis characterized by diffuse, opaque white spots distributed across the enamel surfaces of the maxillary and mandibular teeth. Based on shade guide assessment, shade A3 was selected for the FDP crown. This selection considered the predominant color of the patient's natural dentition, which exhibited generalized fluorosis. The use of shade A3 was expected to prevent the restoration from appearing excessively white or creating a marked color contrast with the surrounding teeth, thereby achieving a more harmonious and natural appearance (Figure 7).



Figure 7. Clinical appearance of dental fluorosis and the edentulous area.

Crown morphology and surface characteristics also play important roles in achieving a natural appearance. The anatomical design of an FDP should consider crown shape and proportions, cervical contours, emergence profile, proximal contacts, pontic design, and its relationship with the gingival tissues. The pontic should exhibit contours resembling those of a natural tooth, with a smooth surface that facilitates cleaning, minimizes plaque accumulation, and helps maintain periodontal health. Appropriate pontic contouring and emergence profile development contribute to a harmonious anatomical transition between the restoration and surrounding tissues. FDP evaluation should also consider the morphology of the soft tissues surrounding the pontic and the compatibility of the restoration with the patient's esthetic and functional requirements (Bukhari et al., 2022).

The try-in procedure before definitive cementation is an essential stage for evaluating the color and anatomical form of the restoration directly in the oral cavity. During this stage, marginal adaptation, proximal contacts, pontic-tissue relationships, retention, stability, and

occlusion can be assessed. Color evaluation before definitive cementation also provides an opportunity for adjustments if discrepancies with the natural dentition are identified(Dewi et al., 2021), prosthodontic rehabilitation in this case was not solely intended to replace the missing tooth but also to restore oral function and achieve a restoration that harmonized with the patient's existing dentition. The selection of a fixed-fixed bridge, with teeth 33 and 35 serving as abutments and a modified ridge-lap pontic replacing tooth 34, was based on the condition of the edentulous space and the suitability of the abutment teeth. The presence of dental fluorosis required particular attention to esthetic considerations, especially because alterations in enamel opacity and color may result in variations in the overall appearance of the patient's dentition.

CONCLUSION

The rehabilitation of tooth 34 in a patient with dental fluorosis using a fixed-fixed bridge made of porcelain-fused-to-metal (PFM), with teeth 33 and 35 serving as abutments and a modified ridge-lap pontic replacing tooth 34, represents a suitable treatment option for restoring masticatory function and maintaining dental arch continuity. The favorable clinical and radiographic conditions of the abutment teeth support the success of the prosthodontic treatment. The presence of dental fluorosis requires particular consideration of esthetic aspects, especially during restorative shade selection, to achieve a harmonious appearance with the surrounding dentition.

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