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PROSTHODONTIC REHABILITATION USING POLYETHERETHERKETONE (PEEK) ANTERIOR BRIDGE IN PATIENT WITH PERIODONTAL LESION

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Abstract

***Background**: Prosthodontic rehabilitation involving teeth with periodontal disease is challenging. Restoration must be designed to withstand mastication with good esthetic and appropriate phonetic. Fixed bridge prosthesis are indicated to splint mobile teeth so that pressure on teeth will be stabilized. All-ceramic material often chose for their esthetics but clinical failures still occur, such as chipping and delamination. Ceramic material with high stiffness concentrates stress on the restoration, whereas materials with low stiffness transmit stress to cement layer and abutment teeth. Polyetheretherketone (PEEK) with its bio-inert properties and modulus elasticity 12 GPa similar to bone can be considered as an alternative to overcome this problem. **Objectives:** Rehabilitating missing teeth with PEEK anterior bridge prosthesis to restore teeth function with periodontal lesion and good esthetics. **Case Report:** A 45-year-old male patient came to Dental Hospital Universitas Sumatera Utara complaining lack of confidence due to missing front teeth and want to improve his appearance. The patient had a history of extracting his fractured front tooth due to motorcycle accident. Intraoral examination #11 #21 missing, #22 non-vital, mobility 1 with elongation. Radiographic examination revealed periodontal lesion in the apical 1/3 of the root. Treatment started with endodontic treatment #22 to avoid periodontic-endodontic infection. Fixed bridge 6-unit PEEK prosthesis were selected to splint lateral incisors along with other healthy abutments that complied with Ante's law. The shock absorber properties of PEEK provide an advantage for teeth with periodontal lesion because pressure will be distribute well thereby accelerate healing. **Conclusion:** Fixed bridge PEEK can be an alternative treatment especially in patients with periodontal lesion.*

***Keywords:** Prosthodontic Rehabilitation, Anterior Bridge, Polyetheretherketone, Periodontal Patient*

INTRODUCTION

The loss of a single anterior tooth can be a complex problem for the patient. In the case of advanced periodontal disease, tooth loss is generally always preceded by tooth mobility due to severe bone loss. In addition, periodontal disease also chronically dislodges teeth due to the masticatory movement of the mobile teeth, which affects the anterior aesthetics, especially for the upper anterior teeth. Therefore, prosthodontics rehabilitation is needed to restore esthetics and function in teeth with periodontal abnormalities.[1, 2]

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Prosthodontic treatment of anterior teeth with periodontal disorders such as mobility and chronic dislodgement is often a dilemma when it comes to tooth extraction because it can affects the anterior esthetic. This challenge is particularly common in cases of severe labial or lingual dislodgement. Recently, adequate orthodontic and periodontal treatment has been attempted to improve the periodontal condition and anterior esthetics. However in such cases, periodontal breakdown causes pathologic migration of teeth makes the orthodontic treatment more complicated. There is a clear need for splinting of the teeth, and additional prosthetic treatment may be necessary. Studies have shown that teeth with poor periodontal support and progressive mobility can serve as reliable abutments for extensive fixed splints/bridges after maintaining healthy periodontal tissues and can be maintained in the remaining dentition. In this case, the fixed dental prosthesis must be fabricated properly to prevent undue stress concentration on the abutment periodontal tissues. Fixed bridge dental prosthesis is a treatment that shows high mechanical strength and resistance to dislodgement. Fixed restorations have been used for several years for splinting teeth with most effective results and long-term durability follow-up.[1-4]

Research shows that tooth mobility is reduced by splinting of the teeth that have mobility. One of the main reasons for splinting and stabilizing teeth is to link them as an adjunct treatment to periodontal therapy. In the selection of the treatment to be chosen, the basic requirements of marginal fit, psychological contours, the possibility of maintaining oral hygiene, and occlusion without trauma must be met. Although the restorations must be designed to withstand the functional requirements of occlusion and masticatory loads, restorations in anterior teeth have an additional need to achieve an acceptable esthetic result, as well as ensuring proper phonetics.[1-5]

Currently, various materials have been used for esthetic restoration of periodontally-involved anterior teeth with mobility and chronic dislodgement. All ceramic materials are the most frequently chosen material because of its esthetic properties that similar to natural teeth. However, a systematic review of survival and complication rates showed that all ceramic material failure was still higher than metal-based crowns. The most common clinical failures are chipping and delamination of veneering layer.[6-12] this may be related to Elie [13] study which stated that choice of crown material had a great influence on maximum principal stress in the crown. Increasing the stiffness of the material will concentrates more stress within the crown, whereas the material with a lower stiffness transfer more stress to the cement layer and tooth supporting core. All ceramic material has a modulus elasticity of about ±100 GPa.

In recent years, polyetheretherketone (PEEK) material has modulus of elasticity at around 12 GPa similar to cortical bone at around 15 GPa has been widely used in dentistry, especially in prosthodontics. PEEK material has bio-inert properties and has a solid structure as a result of processing during the compression-molding process, there is good biocompatibility.. Polyetheretherketone (PEEK) has been used in medicine for many years, particularly in orthopedics for more than 40 years. This material, and the evolution of its new high performance, attracted the attention of researchers for its notable mechanical properties. Over the years, this material has evolved, leading to its reinforcement by inserting fibers or ceramics inside (less than 0.5 µm in diameter) to improve its mechanical strength, resistance to stress, and esthetics. The use of this material is indicated in fixed prostheses for single crowns, bridges with one or up to two pontics, adhesive bridges (Maryland), and in removable prostheses.[14-6]

In this case report, a polyetheretherketone (PEEK) anterior fixed bridge prostheses is chosen to rehabilitate missing teeth and restore function of the teeth with periodontal abnormalities with good esthetics.

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CASE REPORT

A 45-year-old male patient came to Dental Hospital Universitas Sumatera Utara complaining lack of self-confidence due to missing front teeth and want to improve his appearance. The patient had a history of extracting his upper front tooth which was fractured due to a motorcycle accident several years ago. Patient want to wear a denture that non-removable. On extra oral examination, the patient was in good condition with an oval face shape and a convex facial profile (Figure 1). Examination of the temporomandibular joint did not reveal any abnormalities. Intra oral examination of tooth, #11 #21 was missing, #22 non-vital with mobility grade 1 and 1,5 mm elongation. Periapical radiographic examination revealed a periodontal lesion in the apical 1/3 of the root of tooth #22 as a result of the traumatic occlusion of the elongated tooth (Figure 2).

Figure 1: Pre-treatment, (left) patient profile, (right) intra oral

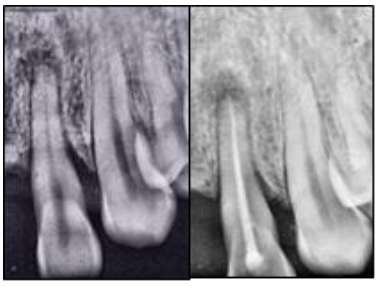

Figure 2: Periapical radiograph #22; Pre-post root canal treatment

Based on the subjective, objective and supportive examination, patient was diagnosed with partially edentulous Class IV Kennedy on maxilla with edentulous teeth #11 and #21. Treatment was started by scaling the teeth on the maxilla and mandible and followed by endodontic treatment of tooth #22 to avoid the risk of periodontic-endodontic infection (Figure 3).

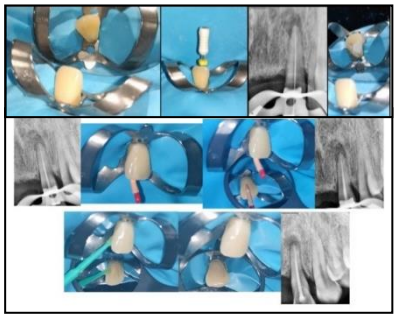

Figure 3: Root canal treatment #22

After the root canal treatment for tooth #22 was completed, the abutment preparations for teeth #13, #12, #22, and #23 were performed with the same alignment controlled with a parallel mirror. Chamfer finish line design with equigingival position was chosed (Figure 4). Final impressions were

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then performed using a two-step impression technique with a spacer after the gingival cord was attached to the sulcus of the abutment teeth. Master cast then sent to the laboratory for PEEK coping fabrication.

Figure 4: Final preparation

PEEK fixed bridge prostheses coping try in then performed. Examination of the shape, position and adaptation of coping was carried out at the try-in stage (Figure 5). The resin veneering is then carried out on coping by layer to layer. The veneered bridge and polished were cemented using GIC type 1 cement.

Figure 5: Try-in koping

Patients were instructed to carry out regular check-ups and given oral health education to improve and maintain good oral hygiene.

A 6-unit polyetheretherketone (PEEK) bridge prosthteses was selected for the splinting effect of lateral incisors with periodontal lesion along with other healthy abutments that complied with Ante's law. The shock absorber properties of PEEK provide an advantage for teeth with periodontal lesion because the stress distribution will be better distributed, thus accelerate healing. The patient was satisfied with his appearance and had no complaints about his lateral incisors (Figure 6).

Figure 6: Post-treatment

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DISCUSSION

Restoration of anterior teeth with periodontal abnormalities can be a complicated problem, especially if the underlying cause of tooth mobility have not been properly diagnosed. Splinting of teeth with mobility has been a common treatment option for decades and can help patients retain their natural teeth for several years. The basic functions of splinting is to restore patient confidence in tooth mobility context, ensure tooth function, to distribute the occlusal forces on the periodontally compromised teeth and finally contribute to their clinical survival.

Anterior teeth with periodontal abnormalities that presenting with mobility after initial periodontal therapy were then continued with root canal treatments to prevent combined periodontic-endodontic lesions and to eliminate tooth sensitivity caused by gingival recession. This approach is an empirical clinical therapy that preclude the possibilities of periodontic-endodontic infection. Another goal of root canal treatment in this case was to provide convenience for the esthetic restoration due to the elongation of tooth #22 so invasive tooth preparation can be done. After successful periodontal treatment followed by a periodic check-ups, the splinting of teeth is an important step to maintain its clinical function.

Polyetheretherketone has been used for various indications in dentristy such as in prosthodontics for almost 15 years. PEEK has also shown excellent results in the fabrications of partial coverage fixed dental prostheses, especially in the anterior teeth. PEEK also has a low elastic modulus of ±12 GPa similar to bone and its shock absorber properties. Restoration of anterior fixed bridge restoration with PEEK material is expected to transfer pressure to the cement layer and the supporting tissues of the teeth so it didn't aggravate tooth mobility and accelerate the healing of the periodontal lesion. Based on the advantages of polyetheretherketone material, PEEK fixed bridge restoration was chosen as the maxillary anterior splint to combine the esthetic performance and strength of the masticatory pressure.

CONCLUSION

Fixed bridge PEEK can be an alternative treatment especially in patient with an abutment with periodontal disorders.

SUGGESTION

Research on stress distribution on periodontally involved teeth using polyetheretherketone can be made to ensure effectivity of those material accelerating periodontal healing.

Data availability

The data used to support the findings of this study are included within the article.

Conflict of interest

There are no conflict of interest.

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