

Innovation of removable partial denture with esthetic clasp assembly:

A Case Report

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Abstract

In removable partial dentures, clasp retainers made of metal alloys are not esthetically pleasing for the patients especially in the esthetic zone. This case report aims to evaluate the effect of esthetic clasp retainers for removable partial denture patients. Polyetheretherketone (PEEK) is a ketone-based semi-crystalline thermoplastic material which has been proved to have excellent mechanical and chemical properties and biocompatibility. This material can be used for patients who dislike metal display of retentive clasps and the denture framework. In this case report, PEEK clasps were fabricated by CAD/CAM technology to create tooth-colored esthetic clasps and occlusal rests of a removable partial denture for a 25-year old female patient with partially edentulous mandible (Kennedy Class III modification 1). After final prosthesis delivery, the patient was highly satisfied (Satisfactory Rate – 92.86%) as there was no metal exposure of the clasps. At 3 months and 6 months follow-ups, no change of any clasp was observed and her masticatory performance assessed by Xylitol color changeable chewing gum was score 9 out of 10. From this case report, we could conclude that innovation of RPDs with PEEK clasps in place of Cobalt-chromium clasps can restore masticatory function with better esthetic results.

Keywords

Clasp retainer, esthetic clasp, masticatory performance, patient satisfaction, polyetheretherketone (PEEK), removable partial denture.

Introduction

The available treatment options for partially edentulous patient are removable partial denture (RPD), fixed partial denture and dental implant supported prostheses. Among them, RPDs are effective and affordable treatment option for partial edentulism [1]. In treatment of partially edentulous arches, the clasp retainers are essential component parts for direct retention of a removable partial denture. The clasp retainers are conventionally

made by metal alloys and the problems related to Cobalt-chromium (Co-Cr) alloys such as fracture of clasps, esthetically unacceptable display of metal clasp have been documented [2]. Nowadays, most patients emphasize on esthetic and thus oral appearance becomes critical for achieving better treatment outcomes. The presence of metal clasp like (Co-Cr), gold or stainless steel is not esthetically pleasing for the patients especially in visible zones. So, natural-colored Polyetheretherketone (PEEK) material can be used for the patients who dislike metal display of the retentive clasps and the denture framework.

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Polyetheretherketone (PEEK) is a ketone-based semi-crystalline thermoplastic material that has been widely used for medical and industrial applications because of its good mechanical and chemical resistance properties [3]. Although PEEK has been used for years in orthopedics and medical technology, it was introduced to dental fields in 1992. In dentistry, it was used for crowns, implant superstructures, fixed partial dentures and RPD framework in recent times. It was stated that PEEK material could be used as an alternative to conventional materials used in implantology [4].

In this case report, we used PEEK to fabricate the clasp assembly in visible zones of RPD. The purpose of this case report was to evaluate the effect of esthetic clasp retainers for removable partial denture patients.

Materials and methods

In this case report, 25 years old female patient came to Prosthodontics department, University of Dental Medicine, Mandalay with the chief complaint of missing teeth in her lower

Jaw. Being a young lady, she had high esthetic demand. After clinical assessment was done, partially edentulous mandible (Kennedy Class III modification 1) was planned to restore with RPD and there were all natural dentition on maxillary arch (Figure 1).



Figure 1. Pre-op intraoral view of partially edentulous mandible

A detailed examination revealed a satisfactory oral hygiene and her periodontal condition for all remaining teeth was good. The denture design had

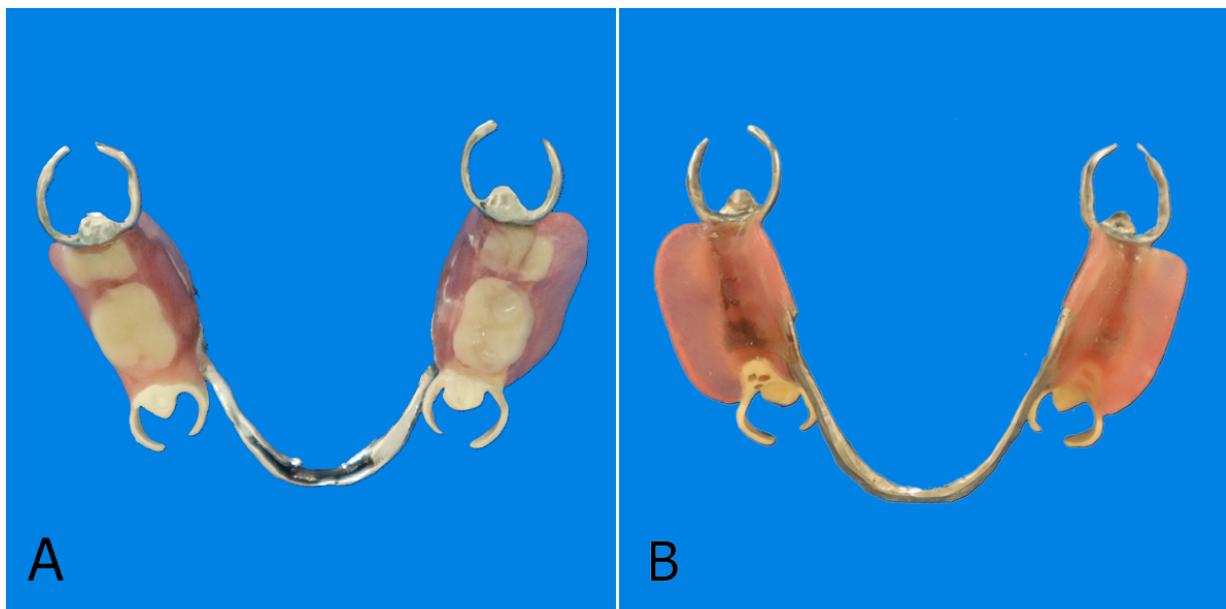


Figure 2. Mandibular RPD with PEEK disto-occlusal rest & clasp assembly (A) occlusal surface (B) fitting surface

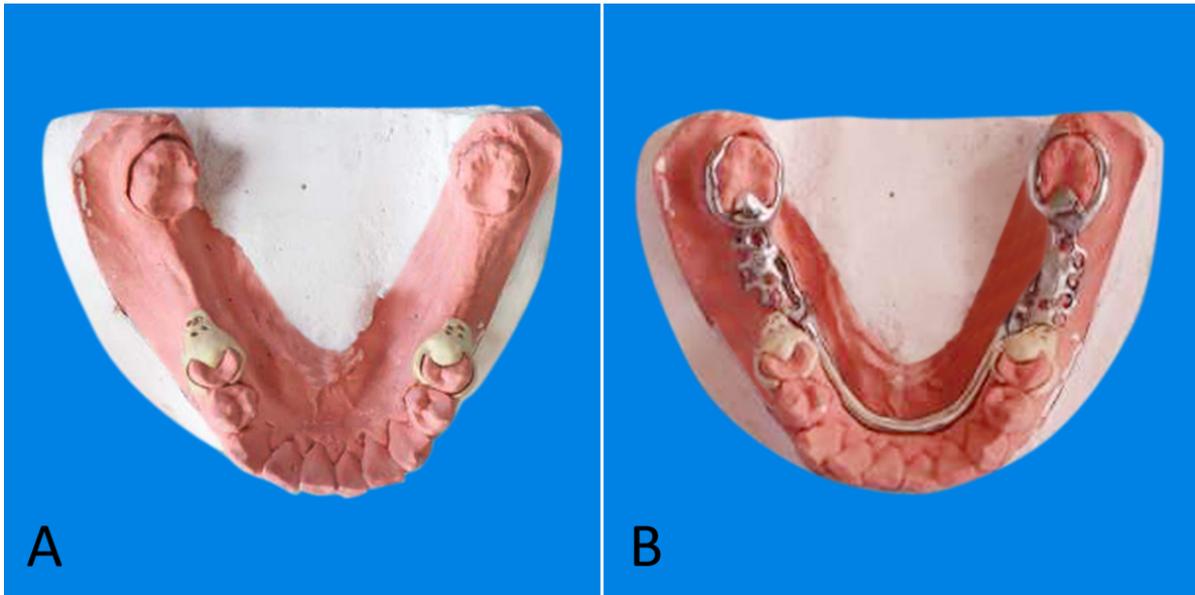


Figure 3. (A) PEEK rest & clasp assembly fitted on working cast (B) Co-Cr framework & PEEK fitted on working cast

been made as lingual bar as major connector because the lingual sulcus depth was more than 8 mm when measured (Figure 2). According to the favorable undercuts, circumferential clasps with distal rests on 35, 45 were made by PEEK and Co-Cr circumferential clasps with mesial rests on 37, 47 were made. PEEK clasp assembly was designed by CAD/CAM technology to create tooth-colored esthetic clasps and occlusal rests of RPD from a PEEK disk. The metal framework and PEEK clasp assembly was tried in the patients' mouth for accurate adaptation (Figure 3). Then, denture was fabricated according to standardized procedures and denture delivery was done.

Results

At the time of final prosthesis delivery, patient satisfaction with the denture was recorded by using questions adapted from patient evaluation questionnaire (PEQ) and the patient was highly satisfied (Satisfactory Rate-92.86%) with the denture as there was no metal exposure of the clasps (Figure 4).

After 3 months and 6 months follow-ups, there was no change of any clasp was observed and no gingivitis or periodontitis in relation to the abutment teeth was observed. When analyzing the masticatory performance, the patient scored 9 out of 10. Therefore, using the PEEK clasp assembly in RPD for restoring partial edentulism may not affect the patient's masticatory performance.

Discussion

The choice of material for construction of RPDs should be based on clinical examination, patients' demands, and scientific evidence. There were several patients who failed to wear removable partial dentures because they found that the metal display of clasp assembly was esthetically undesirable [5].

The slightly grayish white, non-transparent color of PEEK was more acceptable than the silver color of a metal clasp [6]. Because of its color, high strength and elasticity, PEEK can fabricate RPD with metal free esthetic clasps and occlusal rests with better occlusal stability. The modulus of elasticity of PEEK was 3-

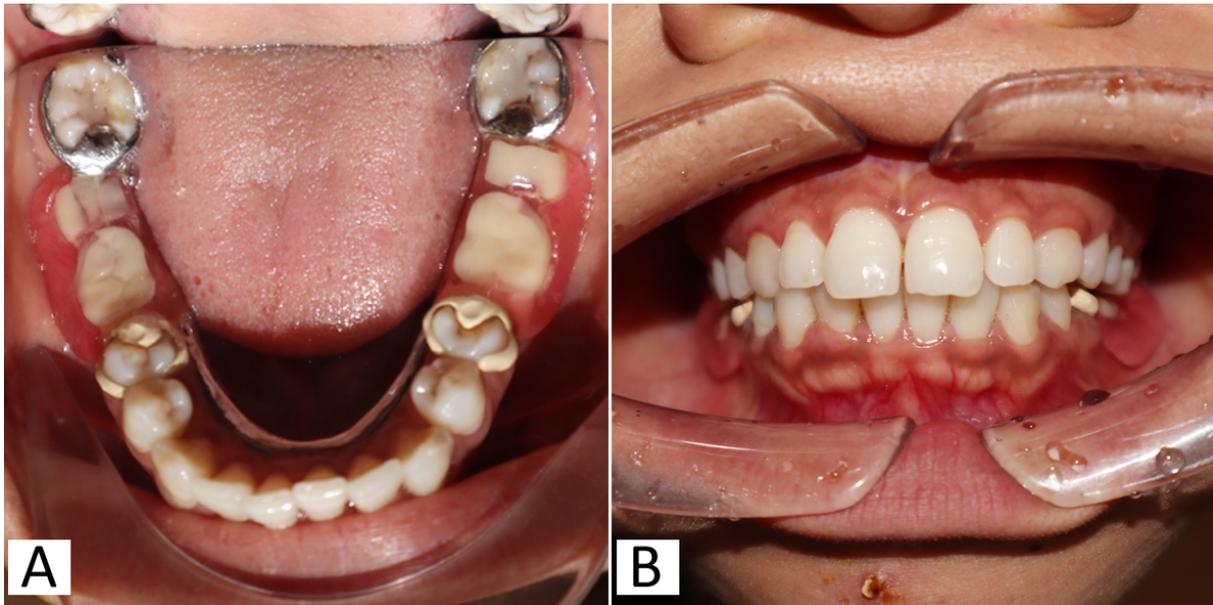


Figure 4. Intraoral views after denture insertion (A) occlusal view (B) Front view

4 GPa and it was as elastic as human bone [7].

So, it can reduce stresses transferred to the abutment teeth. Besides, it can be well polished and have low plaque retention [8]. On the other hand, the method of fabrication is more expensive than conventional technique and it may be unaffordable to partially edentulous patients with financial constraints [9]. However, only clasp assembly in this case report is more economy and could solve this financial problem.

In addition to appearance, proper design of RPD is important for maintenance of periodontal health [10]. Adequate tooth preparation and correct planning of RPD design according to biomechanical principles allows proper hygiene, less plaque accumulation and would reduce the incidence of caries and periodontal diseases [11]. RPD with PEEK clasp provide a hygienic design that simplifies oral hygiene access. Then, her masticatory performance of the denture was evaluated by color changeable chewing gum (Masticatory Performance Evaluating Gum Xylitol, Lotte Co.Ltd., Tokyo, Japan). This color-changeable

chewing gum was useful for an objective masticatory performance of the denture wearer and could contribute to prosthetic treatments according to patient's satisfaction for dentures [12]. The patient was asked to chew the gum for 100 strokes and the color changes of the gum after chewing was measured using color scale provided by manufacturer. When analyzing the masticatory performance, conventional metallic clasp dentures achieve the masticatory score of 9 out of 10. In this case, the patient's masticatory performance was also 9. Therefore, using the PEEK clasp assembly in RPD for restoring partial edentulism may not affect the patient's masticatory performance.

From this case report, we could conclude that innovation of RPDs with PEEK clasp assemblies in place of Co-Cr clasp assemblies can restore masticatory function with better esthetic results. Therefore, PEEK clasp assembly could be recommended as useful alternative to conventional metal clasp especially in treatment of partially edentulous patient with high esthetic demand.

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