



THE COMBINATION OF A NYLON AND TRADITIONAL PARTIAL REMOVABLE DENTAL PROSTHESIS FOR IMPROVED ESTHETICS: A CLINICAL REPORT

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A benefit of a nylon partial removable dental prosthesis (PRDP) is the absence of a metal framework, providing improved esthetics. Unfortunately, the lack of a traditional framework reduces rigidity and the support of occlusal rests. This clinical report describes a combination of a nylon PRDP (polyamide denture base resin) and a traditional PRDP (framework/resin) for a Kennedy Class II, Modification 1, partially edentulous mandible. (*J Prosthet Dent* 2013;109:5-8)

The nylon partial removable dental prosthesis (PRDP), which has no metal framework or retentive metal clasp and which provides patients with improved esthetics¹ and improved comfort, was first described in 1955.² In addition, polyamide denture base resin is thought to offer some advantages for those patients who are allergic to heat-polymerized poly(methyl methacrylate) (PMMA) resin.³ Unfortunately, the nylon PRDP lacks important elements of the traditional PRDP, in particular, occlusal rests and a rigid framework. Therefore, the reinforcement of a denture base fabricated from a polyamide denture base resin is recommended.⁴

The major connector provides the traditional PRDP with sufficient rigidity, and support is provided by rests and the residual ridge.^{5,6} However, the visibility of the retentive arm sometimes causes a cosmetic problem for patients. For these patients, an attachment may be considered, but the need for a crown prosthesis, possible endodontic treatment, additional chair time, and postinsertion care

may make such an option financially unacceptable.⁵

A combination of the nylon and traditional PRDP could enhance the removable prosthesis and benefit patients in terms of esthetics and reduced cost. A nylon PRDP could be an easy and inexpensive way to improve the esthetics of a traditional PRDP by replacing the anterior retentive clasp with nylon clasps as part of the anterior flange. This clinical report describes the essentials of the design of a combined nylon and traditional PRDPs.

CLINICAL REPORT

A 61-year-old Asian woman was seen at the Department of Prosthodontics, Nihon University School of Dentistry at Matsudo, Chiba, Japan for a comprehensive examination in April 2006. The patient was treated in the following manner. The second maxillary right molar, first maxillary left premolar, second left mandibular molar, and second left mandibular premolar were extracted. Endodontic

therapy of the right and left maxillary canine and the second and maxillary left premolar was performed. A maxillary partial fixed dental prosthesis and a mandibular traditional PRDP were fabricated.

The patient's dental treatment was completed in November 2007, and periodontal supportive therapy was performed approximately every 3 to 4 months. The patient returned in June 2008 complaining that the mandibular right partial fixed dental prosthesis spanning the right mandibular first premolar and right mandibular second molar had fractured. The patient also requested the fabrication of a nylon PRDP instead of a fixed prosthesis. She had worn the traditional PRDP for 2 years and disliked the metal clasps that were visible when she smiled. However, the patient was satisfied with the labial esthetics and was not concerned about the visibility of the mandibular metal occlusal rests. In November 2008, the maxillary left lateral incisor was extracted because of a root fracture, and a maxillary traditional PRDP was fabricated.

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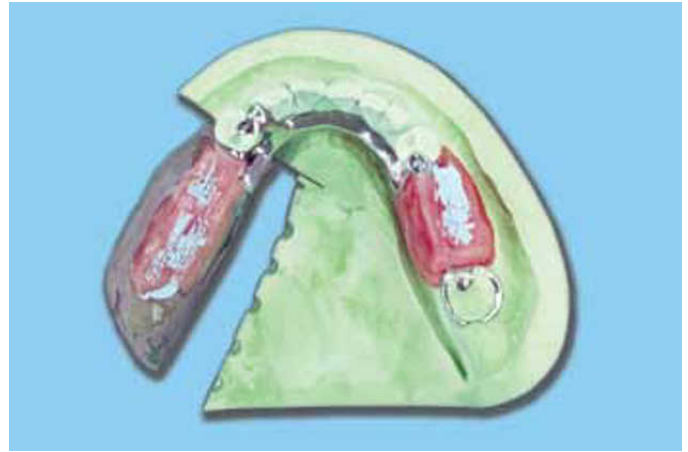
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1 Mandible after crowns had been replaced.



2 Altered cast technique.



3 Definitive restoration. Polyamide-based resin was used for denture base with metal framework.



4 Definitive restoration with improved esthetics.

An implant-supported fixed dental prosthesis or a traditional PRDP with attachment retention was deemed a suitable treatment option for the patient. She opted for a nylon PRDP for economic reasons and because of the reduced treatment time. A combination of a metal partial framework with a nylon prosthesis without metal retention arms in the anterior esthetic zone was suggested. A polyamide denture base resin (Valplast; Valplast Intl Corp, Oceanside, NY) was proposed as an esthetic material for labial retention. An altered cast impression technique was used to improve stability and support from the residual ridge.⁶

A detailed oral examination was performed, and the traditional PRDP was repaired. Endodontic therapy was necessary for the first premolar and second molar abutments on the mandibular right side. After initial

periodontal therapy, surveyed crowns were fabricated for these 2 teeth to reduce the likelihood of future fracture. A Kennedy Class II, Modification 1 mandibular combination (traditional and nylon) PRDP (Fig. 1) was then fabricated for the patient. The acrylic resin custom tray (GC-Ostron II; GC Corp, Tokyo, Japan) was border molded by using GC Impression Compound (GC America Inc, Alsip, Ill), and the definitive impression was made with addition polymerization silicone materials (Exafine Regular and Injection; GC America Inc). The impression was poured with die stone (Fuji Rock; GC America Inc), and a definitive cast was prepared. The metal framework of the combination PRDP was made of a cobalt-chromium alloy (Summalloy Cobalt; Shofu Inc, Kyoto, Japan). The framework of the combination PRDP was evaluated intraorally and was ad-

justed (Arti-Spot; Bausch Articulating Papers, Inc, Nashua, NH). Record bases were made from an autopolymerizing acrylic resin (GC-Ostron II; GC Corp) and wax (GC Base Plate Wax; GC Corp) that was attached to the latticework of the metal framework. An altered cast impression was made with polyether impression materials (Impregum Soft; 3M ESPE, St Paul, Minn), and a jaw relation record was then made by using zinc oxide-eugenol paste (Super Bite; Bosworth Co, Skokie, Ill) as shown in Figure 2. The definitive combination PRDP was then processed by using a polyamide-based resin (Valplast; Vaplast Intl Corp) for the denture base with no metal retentive clasp arms (Fig. 3). This ensured that there was no metal clasp in the anterior esthetic zone (Fig. 4).

After 2 years, the combination PRDP was functioning well, although



5 After 2 years, nylon material surface shows some discoloration.



6 After 2 years, gingiva of abutment tooth shows lack of inflammation.

the nylon material surface showed some discoloration (Fig. 5). The gingiva of the abutment tooth remained free from obvious inflammation (Fig. 6).

DISCUSSION

A nylon PRDP whose clasps are visible when the patient smiles may be used to improve anterior esthetics. However, nylon PRDPs are contraindicated for the Kennedy Class II partial edentulous space because they lack the basic elements of traditional PRDPs, such as a major connector and occlusal rests.⁵ The nylon material used for a distal extension PRDP cannot be relined, so stability is a concern if the alveolar ridge resorbs over time.⁷

To reduce these problems, an altered cast impression technique improves support by using rests and the alveolar ridge mucosa. Feit⁶ found that the altered cast impression technique of fabricating traditional PRDPs, described more than 60 years ago, improves the residual-ridge-to-dentition relationship of the prosthesis. This may increase patient satisfaction while preserving the remaining supporting structures.

A negative aspect of using polyamide base resin is its surface roughness and the difficulty in polishing it.^{2,8} The roughness may lead to bacterial and fungal colonization of its surface.⁸

The use of polyamide base resin requires that patients be more hygiene conscious than if conventional heat-polymerized PMMA resin were used.

Zlatarić et al⁹ reported that the differences in gingival inflammation between the plate and dental bar designs suggest that covering more gingival tissue promotes the development of gingivitis, which may subject the area to periodontal disease. Figure 4 shows the components of the polyamide denture base resin that cover more gingival tissue.

After 2 years, the nylon material seemed to show some discoloration on the surface (Fig. 5). The gingiva of the abutment tooth showed no evidence of inflammation (Fig. 6). The polyamide clasp seemed to function well in terms of retention, and lack of reciprocation did not seem to be a problem as there was no evidence of excessive abutment mobility.

This clinical report describes the essential design elements for traditional PRDPs, including providing sufficient rigidity with a major connector and sufficient support with rests and a residual ridge. In addition, supportive periodontal therapy is important in order to maintain a good periodontal environment for the abutment teeth. The combination of a nylon and traditional PRDP provided improved esthetics for the patient.

SUMMARY

This clinical report describes a nylon PRDP (polyamide denture base resin), which was fabricated by using an altered cast impression technique. Esthetic requirements were addressed by using a polyamide denture base resin on the labial side. The combination PRDP (Kennedy Class II, Modification 1) was fabricated to ensure both the rigidity of a metal framework and the necessary support of rests and a residual ridge.

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NOTEWORTHY ABSTRACTS OF THE CURRENT LITERATURE

Regular and platform switching: bone stress analysis varying implant type

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Purpose: This study aimed to evaluate stress distribution on peri-implant bone simulating the influence of platform switching in external and internal hexagon implants using three-dimensional finite element analysis.

Materials and Methods: Four mathematical models of a central incisor supported by an implant were created: External Regular model (ER) with 5.0 mm × 11.5 mm external hexagon implant and 5.0 mm abutment (0% abutment shifting), Internal Regular model (IR) with 4.5 mm × 11.5 mm internal hexagon implant and 4.5 mm abutment (0% abutment shifting), External Switching model (ES) with 5.0 mm × 11.5 mm external hexagon implant and 4.1 mm abutment (18% abutment shifting), and Internal Switching model (IS) with 4.5 mm × 11.5 mm internal hexagon implant and 3.8 mm abutment (15% abutment shifting). The models were created by SolidWorks software. The numerical analysis was performed using ANSYS Workbench. Oblique forces (100 N) were applied to the palatal surface of the central incisor. The maximum ($\sigma(\max)$) and minimum ($\sigma(\min)$) principal stress, equivalent von Mises stress ($\sigma(\text{vM})$), and maximum principal elastic strain ($\epsilon(\max)$) values were evaluated for the cortical and trabecular bone.

Results: For cortical bone, the highest stress values ($\sigma(\max)$ and $\sigma(\text{vM})$) (MPa) were observed in IR (87.4 and 82.3), followed by IS (83.3 and 72.4), ER (82 and 65.1), and ES (56.7 and 51.6). For $\epsilon(\max)$, IR showed the highest stress (5.46e-003), followed by IS (5.23e-003), ER (5.22e-003), and ES (3.67e-003). For the trabecular bone, the highest stress values ($\sigma(\max)$) (MPa) were observed in ER (12.5), followed by IS (12), ES (11.9), and IR (4.95). For $\sigma(\text{vM})$, the highest stress values (MPa) were observed in IS (9.65), followed by ER (9.3), ES (8.61), and IR (5.62). For $\epsilon(\max)$, ER showed the highest stress (5.5e-003), followed by ES (5.43e-003), IS (3.75e-003), and IR (3.15e-003).

Conclusion: The influence of platform switching was more evident for cortical bone than for trabecular bone, mainly for the external hexagon implants. In addition, the external hexagon implants showed less stress concentration in the regular and switching platforms in comparison to the internal hexagon implants.

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