Surface Evaluation of the Combination of a Nylon and Traditional Partial Removable Dental Prosthesis: 3.5-year Follow-up Clinical Report

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Abstract
A nylon partial removable dental prosthesis (PRDP) is aesthetically superior to a traditional PRDP. However, the nylon surface becomes rough after long-term use. There have been few clinical follow-up reports concerning the re-polished surface after long-term insertion of the nylon PRDP.
We observed the re-polished surface of the nylon denture base with a microscope and a contact profilometer.
This clinical report describes a PRDP constructed from a nylon denture base resin and a metal framework, which obtained a good prognosis during 3.5 years of use. The rough surface of the nylon was improved by re-polishing. However, the deformation of the nylon retentive arm and required relining impeded its long-term use.

Introduction
A combination of nylon and traditional materials in a partial removable dental prosthesis (PRDP) could be an easy and inexpensive method to improve the aesthetics of a traditional PRDP by replacing the anterior retentive metal clasps with nylon clasps as part of the anterior flange (1-4).
Nylon is the generic name for the polyamide class of thermoplastic polymers (5). Unfortunately, the nylon PRDP lacks important elements of the traditional PRDP, in particular, occlusal rests and a rigid framework. Therefore, reinforcement of the denture base fabricated from a polyamide resin is recommended. To solve this problem, the combination PRDP was fabricated with a metal framework and a polyamide-based resin (Valplast; Valplast Intl Corp, Oceanside, NY, USA) for the denture base with no metal retentive clasps in the anterior aesthetic zone (1).

We previously reported the 2-year follow-up clinical report on the combination PRDP (1). While the nylon PRDP provides an aesthetic benefit, the nylon surface is rough and is difficult to polish (6, 7). There have been few clinical follow-up reports concerning the re-polished surface after long-term insertion of the nylon PRDP (8, 9).
It is well-known that the depths and the widths of scars after scratch test were greater than the acrylic resins, because the surface of nylon is not as hard as that of acrylic resin. Accordingly, the polished surface of nylon loses its luster (8). Also, the polished surface gradually loses its luster after nylon PRDP has been inserted, becoming rougher and darker. These can be improved somewhat by re-polishing at a laboratory used to dealing with nylon i.e., Valplast. It is extremely difficult to grind and polish (9).

This clinical report describes the condition of the combination PRDP 3.5 years after insertion. It also describes the re-polished nylon surfaces that were observed using a microscope and a contact profilometer 3.5 years after insertion.
Case Report

Patient

The 2-year progress report of this case summary is first summarized (1). A 61-year-old woman whose initial visit was in April 2006 was seen at the Department of Prosthodontics, Nihon University School of Dentistry at Matsudo, Chiba, Japan. Prior to the first visit, she had worn a traditional PRDP and disliked the anterior metal clasps that were visible when she smiled. She requested the fabrication of the nylon PRDP for aesthetic reasons.

The combination PRDP was fabricated with a metal framework and a polyamide-based resin (Valplas) for the denture base with no metal retentive clasps in the anterior aesthetic zone. The restoration was worn starting in May 2009. Aesthetic satisfaction of the patient and essential design elements of the traditional PRDP were obtained (1).

Supportive periodontal therapy has been performed approximately every 3 to 4 months with adequate prognosis. Also, re-polishing was performed after wearing at 1.5, 2.5 and 3.5 years at the laboratory.

After 3.5 years of insertion, the combination PRDP was functioning well and the patient remained satisfied, however, the surface of the nylon material was rough and discolored (Fig. 1). There was also an incompatibility of the retentive arm with the abutment tooth (Fig. 2). The gingiva of the abutment tooth remained free from obvious inflammation (Fig. 3). The rough surface (Fig. 1) was re-polished using a special polishing material for nylon materials (Valplast Polishing Kit; Valplast Intl Corp).

While the patient remained satisfied with the combination PRDP, re-fabrication was considered necessary after 3.7 years of insertion because of chipping of the porcelain-fused-to-metal crown of the abutment tooth (The right mandibular first premolar). Furthermore, a mild ridge resorption was found in the distal extension regions, and it was predicted that a reline would be required in the near future. In addition, mild attrition of the artificial teeth was shown.

Because of the poor prognosis of the repair with a composite resin of the porcelain-fused-to-metal crown abutment tooth and difficulty adjusting the retentive nylon arms, the patient agreed to the re-fabrication of the combination PRDP.

Characterization of the nylon material surface

The surface morphology 3.5 years after insertion before (Fig. 4A) and after (Fig. 5A) re-polishing was observed with a microscope (USB Microscope M2; Scalar Corp, Tokyo,
Moreover, the surface roughness (Ra) values of each sample before and after re-polishing were determined using a contact profilometer (DR130, Sato Shoji, Kanagawa, Japan). Fig. 4B and Fig. 5B show the surface morphology of the PRDP surfaces at a magnification of 100x and Ra values.

Discussion

This case showed good progress with aesthetic satisfaction of the patient after 3.5 years of use of a combined nylon and metal framework PRDP. In the partial denture design, the lack of rigidity in the nylon was addressed by using a metal framework for the major connector. Supportive periodontal therapy also contributed to good progress.

After 3.5 years, the nylon material surface was rough and discolored (Fig. 1), and the nylon clasp showed incompatibility (Fig. 2). However, its retentive arm seemed to function well, and lack of reciprocation did not seem to be a problem as there was no evidence of excessive abutment mobility. These conditions were the same after 2 years and 3.5 years. The gingiva of the abutment tooth showed no evidence of inflammation (Fig. 3).

Abuzar et al. (7) reported that the surface roughness of polyamide is well within the clinically accepted norm of 0.2 μm Ra after conventional polishing by lathe. However, in clinical practice the polyamide polishing would be performed with chairside polishing kits. Chatzivasileiou et al. (10) reported that use of the chairside polishing kits resulted in significantly rougher surfaces compared with
those produced by laboratory polishing. Nonetheless, polishing trimmed denture bases using chairside polishing kits is an effective alternative procedure for cases in which the laboratory procedure is not applicable.

This clinical report observed the re-polished surface of the 3.5-year-old nylon denture with a microscope and a contact profilometer. After re-polishing, the nylon surface was improved, i.e., Ra value decreased from 0.42μm (Fig. 4 A, B) to 0.12μm (Fig. 5A, B).

A polyester-based thermoplastic resin (EstheShoBright; i-CAST Corp, Kyoto, Japan) was considered as a new denture base material for labial retention and aesthetic reasons, because it can be easily repaired chairside with self-curing resins (9). It has been reported that a polyester-based thermoplastic resin has adequate fitting accuracy for incorporating metal framework into dentures (11).

Finally, it is better to give advance notice to the patient that a combination of a nylon and traditional PRDP can be considered to re-fabricate in around four years, because of the degradation and deformation of the denture base materials, the absorption of the residual ridge, and unexpected problems.

This clinical report describes a combination PRDP constructed with a nylon denture base resin and metal framework, which obtained a good prognosis after 3.7 years of use. The rough surface of the nylon denture material was improved by re-polishing. However, the deformation of the nylon retentive arm and requirement for relining were considered to interfere with its long-term use.

Conflict of interest
The Authors have declared no conflict of interest.

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