



Creating durable and esthetic gingival anatomy on a polyoxymethylene overdenture by using a chairside procedure

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A popular dental appliance used for cosmetic makeovers and as an overdenture during phased prosthodontic treatment is the Snap-On Smile (SOS)(DenMat). It is fabricated from a proprietary thermoplastic resin polyoxymethylene (POM) copolymer.¹ The SOS material can be as thin as 0.5 millimeters and maintain its strength² and is highly resistant to odors and stains³ in contrast to traditional acrylic resin appliances.⁴

One important limitation of thermoplastic resin used in dental appliances is the difficulty of bonding to its surface.⁵ Thermoplastic resins are highly resistant to solvents at room temperature.⁶ Investigators have used a variety of techniques to enhance bonding, with unpredictable results, including mechanical roughening of the surface, chemical conditioning, and thermal treatments.⁷ The difficulty in bonding to the surface of crystalline thermoplastic resins is associated with the denser packing of polymer chain molecules because of their parallel alignment and strong hydrogen bonding among the chains compared with the properties of amorphous acrylic resin.⁸

The inability to relin a material used for removable dentures also limits its chairside maintenance. SOS appliances are used as overdentures with the following contraindications: severe periodontal disease, cantilever extensions greater than 22 mm, and edentulous spans more than 40 mm.⁹ The capability of relining an SOS appliance would extend the functional and cosmetic applications of the appliance to patients with deficient gingival architecture, resorbed dental alveolar ridges, and advanced periodontal bone loss.

ABSTRACT

Background and Overview. Snap-On Smile (DenMat) appliances are tooth-borne overdentures used for a variety of temporary esthetic applications. However, their benefit can be limited in patients with high smile lines and altered gingival architecture because the teeth look too large.

Case Description. In this report, the author shows the chairside application of a silicone denture relin material used to recreate gingival anatomy on an overdenture fabricated from crystallized acetyl resin, the material used in a Snap-On Smile appliance. The author shows the gingival application's durability of greater than 2 years in a 78-year-old patient with multiple missing teeth and a severe mandibular ridge deformity. The author tested several commonly available denture relin materials and their bonding agents, which are known to bond to acrylic resin but have not been shown to bond to crystallized acetyl resin. The author observed no candida colonization during the 2-year reporting period.

Conclusions and Practical Implications. The author presents a simple and durable chairside technique to reproduce gingival tissue esthetically on Snap-On Smile appliances.

Key Words. Removable prosthodontics; denture relin; Snap-On Smile; silicone; polyacetal; esthetics; gingival mask.

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The most common materials used for chairside relines of removable dentures are plasticized polyvinyl resins and silicone-containing polymers.¹⁰ Most clinical failures of soft relin materials are related to 3 chemical properties: progressive polymerization leading to hardening,⁷ water sorption leading to separation of the

TABLE

Soft-tissue reline products, composition, and bonding chemistry.			
SOFT-TISSUE DENTURE RELINE PRODUCT	MANUFACTURER	PRODUCT COMPOSITION	BONDING CHEMISTRY
Softline Reline Material	Henry Schein	Silicone automix	Ethylacetate primer
Gingival Mask HP	Zahn, Henry Schein	Addition silicone (vinyl terminated polysiloxane)	None
MucoSoft	Parkell	Silicone automix	Dichloromethane, methyl methacrylate monomer, a proprietary organic molecule, and a glazing agent containing vinyl polydimethylsiloxane
Renamel Pink Composite Opaquer	Cosmedent	Light-polymerized flowable microfill composite resin, 1,4-butanediol dimethacrylate, and bisphenol A-glycidyl methacrylate	Acetone solutions of dimethacrylate monomers

liner,^{7,11} and porosity leading to candida colonization.^{7,12} The bond strength of silicone-based denture liners can be increased by chemical solvation and etching of denture base resins with solvents such as poly(methyl methacrylate).¹² To our knowledge, no one has described a method for bonding silicone to POM in dental applications.

METHODS

A patient we previously treated in our office with SOS appliances expressed disappointment in the esthetics of his smile because of the appearance of long white teeth in areas of advanced alveolar bone loss. The patient (aged 78 years) lived independently, was employed, and had active social networks.

We tested a variety of denture relining materials available in a dental office for their adherence to POM resin (Table). Although there are no dental relining products specifically designed for POM, we followed the manufacturer's instructions for bonding to acrylic.

We microetched the surface of the SOS with 90-micrometer aluminum oxide particles (Danville Engineering) to increase surface roughness. We used a Valo curing light (Ultradent) to polymerize the composite resin.

Home care instructions for SOS appliances included daily rinsing of the appliance in cold water with a clear dish soap and mechanical cleaning with a cotton tip applicator. During 3-month in-office recall visits, we placed the appliance for 5 to 10 minutes in an ultrasonic bath in a tarter and stain remover solution (Tarter and Stain Remover, Benco Dental) containing sulfamic acid, benzyl ammonium chloride, and isopropyl alcohol. Acetyl resins are sensitive to acids⁶; however, this exposure routine did not result in any surface changes to the SOS appliance in 5 years or to the MucoSoft (Parkell) relining material added to the SOS in more than 24 months.

RESULTS

MucoSoft was the only silicone product that bonded to the SOS (Figure 1). The instructions for MucoSoft report that this product is "not for relining nylon-based 'flexible' denture materials, e.g., Flexite[®], Valplast[®], etc." and says to not feather edge margins.¹³ The Softline Reline Material (Henry

Schein), Gingival Mask HP (Zahn, Henry Schein), and the Renamel opaquer composite (Cosmedent) separated from the SOS within 24 hours after chairside application.

Clinical case. An SOS overdenture appliance was the definitive treatment for a 78-year-old patient with a complex history of bisphosphonate-induced osteonecrosis of the mandible, type 2 diabetes, loss of several teeth, and a fractured mandible.¹⁴ The patient had a high smile line, resorbed alveolar ridges, edentulous spans greater than 20 mm, and deficient gingival tissue architecture (Figure 2A).¹⁴

We fabricated the initial overdenture appliance in 2010 (Figure 2B). The patient was satisfied with the appliance but noted 3 moderate concerns: food lodged around the border of the appliance, increased awareness of sibilant S sounds, and the teeth appeared long. We placed MucoSoft tissue relining material in May 2014 (Figure 2C). It did not dislodge during daily use, routine home care, and in-office maintenance for more than 19 months (Figure 2D). It continued to function (> 33 months) in the maxillary appliance and required 1 replacement in the mandibular appliance.

The edentulous spans exceeded the manufacturer-recommended parameters for the SOS appliance (Figures 2A and 2B).⁹ The occlusal vertical dimension measured from the cemento-enamel junctions of the maxillary and the mandibular canines was 18 mm. The right mandibular contour defect measured 16 mm from the mucosa covering the prosthetic ridge to the mandibular occlusal table (Figure 2A). The right mandibular distal cantilever spanned from the mandibular right canine to the first molar (approximately 30 mm), and the left maxillary cantilever was approximately 20 mm, replacing the maxillary left first premolar to the first molar (Figure 2A).

ABBREVIATION KEY. POM: Polyoxymethylene. SOS: Snap-On Smile.

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