

# The Hard and Soft Chairside Denture Reline (2nd Edition)

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# The Hard and Soft Chairside Denture Reline (2nd Edition)

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At the conclusion of this educational activity, participants will be able to:

1. Learn current trends in the denture market.
2. Identify the various reasons for an ill-fitting denture.
3. Discuss the options available for chairside denture relining.

## ABSTRACT

Complete and partial removable dentures can become ill-fitting. This can be due to alveolar ridge resorption, wear and damage to the denture base, among other reasons. Chairside denture relining or repairing broken areas can correct many of these problems. Chairside procedures provide immediate resolution, avoiding the edentulous period of time accompanying laboratory relines. This course will demonstrate the evaluation, treatment planning, and implementation of chairside denture relining in a variety of scenarios.



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## INTRODUCTION

When presented with an ill-fitting denture, there are two main options for correction: the hard or soft reline. The selection of the appropriate material is based on various conditions such as the state of the alveolar ridge, the presence of teeth and/or implants, and whether the denture base is acrylic or metal.

## COMMON USES

Chairside materials are used for relines, repairs, border extensions, and immediate dentures. These materials should accurately adapt to the denture-bearing surface, be highly polishable, demonstrate low heat generation during intraoral curing, and have high mechanical strength. They should also have easy handling and minimal chemical irritation, and minimal or no odor or taste. Additionally, they should cure rapidly and be ideal for long-term denture reline applications.

## COMMON CAUSES OF DENTURE FAILURE

In a study by Hummel et al., 65% of dentures had at least one defect. Lack of stability was the most prevalent.<sup>1</sup> Mandibular removable partial dentures (RPDs) had retention problems, whereas maxillary RPDs had problems related to reline material integrity. Tooth wear defects were significantly associated with patient age. A survey of partial removable dental prosthesis types in a distinct patient population was performed by Pun et al. and used to evaluate tooth loss based on partial denture design.<sup>2</sup> The study concluded that “nonmetal RPD frameworks are a common treatment type and rarely include rests.” These materials and designs do not enhance, but rather modify, the stability of the RPD as a primary effect with tooth loss a secondary effect.

In some cases, the denture base may be damaged, or the vertical dimension of occlusion has changed. Occlusal changes can be caused by denture tooth wear resulting in worn, ineffective surfaces. Carlsson’s 1967 studies showed a dramatic loss of bone during the first year after a tooth extraction that continued over the years, even without a denture on the tissue surface.<sup>3,4</sup>

In 1972, Tallgren’s 25-year study showed that denture wearers have continued bone loss over the years. Occlusal forces on the gingival tissues irritate bone, which then resorbs. This results in a decrease in bone volume and density.<sup>5</sup>

In a study by Unger, the vertical dimension of occlusion was compared between edentulous patients who wore dentures and a group of dentulous patients.<sup>6</sup> “In addition, the vertical dimension of occlusion in the edentulous group was measured after 20 years of denture wearing. The results indicated a remarkable correlation in the vertical dimension of occlusion established initially for the edentulous patients when compared with the measurements made for dentulous patients of a similar age range. The mean change in the vertical dimension of occlusion after 20 years of wearing complete dentures was 2.5 mm.”<sup>6</sup>

In another study, Karkazis and Lambadakis noted significant changes

in the vertical dimension of occlusion as demonstrated by diminished facial height over a four-year period in complete denture wearers.<sup>7</sup> “A 4-year cephalometric study was conducted on 14 wearers of complete dentures to quantify the anterior alveolar bone loss and to study any associated changes in the maxillomandibular relationships. Both the occlusal and the rest-face heights underwent a significant decrease while a parallel tendency for anterior rotation was recorded. The continuous bone loss in the anterior mandible had a significant relationship to the reduction of the anterior face height.”<sup>7</sup>

## CHAIRSIDE DENTURE RELINE CHALLENGES

There are many challenges in the chairside denture reline process. In the past, material handling, integrity, and lifespan have been an issue. Also, the question of whether a chairside reline is as effective as a laboratory reline over the long term was a concern.

## RESEARCH

A number of research studies have been undertaken to evaluate, primarily, the bond strength of reline material (hard or soft) to an already processed denture base. This research has evaluated the surface treatment of the denture base prior to reline application, and the denture reline materials and bonding agents themselves. In addition, during the processing, comfort as determined by taste, odor, and heat generation has been evaluated. Once bonded, these materials have been further evaluated as to their efficacy in terms of long-term strength and resiliency as well as either preventing or reducing the number of microorganisms able to colonize on their surfaces.

**Bond Strengths and Processing Comfort:** A 2016 study by Osathananda et al. examined the shear bond strength between reline resins and denture bases.<sup>8</sup> Their findings concluded that “chemical surface treatment of methyl formate-methyl acetate increases the shear bond strength between hard reline resins and denture base resin.” Other methods to improve this bond strength have been attempted including the use of air abrasion, dichloromethane, and ethyl acetate,<sup>9</sup> among others. A 2014 study evaluated the bond strength of chairside reline resins.<sup>10</sup> The results were compared with lab-processed resins. The failure sites were examined by scanning electron microscopy and showed the bond strengths to be equal among all techniques. Also, the clinical properties of resilient denture lining materials may be influenced by the methods used to polymerize them.<sup>11</sup> Other studies investigated

temperature rise during intraoral polymerization that can cause discomfort,<sup>12,13</sup> and the durability through flexural strength<sup>14</sup> has also been measured.

**Material Strength and Prevention of Microorganism Colonization:** In addition, areas with poor reline adhesion and/or roughness are potential sites for candidiasis development. A study was conducted between resin and silicone liners measuring the presence of candida. Resin surfaces presented sharp valleys and depressions, while silicone-based specimen surfaces exhibited gentler features.<sup>15</sup>

## Resin surfaces presented sharp valleys and depressions, while silicone-based specimen surfaces exhibited gentler features.<sup>15</sup>

A study by Landayan et al. chose to evaluate the “effect of aging on tear strength and cytotoxicity of soft denture reline materials.”<sup>16</sup> Their study tested the viability of mouse fibroblasts when exposed to commonly used soft reline denture materials. They concluded that, in fact, aging could be a contributing factor to the toxicity of these materials against their selected cellular models.

Other studies have investigated the efficacy of reducing *Candida albicans* with media such as benzalkonium chloride. By mixing benzalkonium chloride with soft and hard denture reline materials (Shoreline Medium, Tokuyama and Rebase II, Tokuyama) both the mechanical strength and the antimicrobial efficacy of the materials were evaluated. It was determined that benzalkonium chloride “did not reduce the flexural strength of the hard liner... and that benzalkonium chloride can be a promising agent reducing the *C. albicans* and *S. mutans* viability on the soft and hard denture liner surfaces.”<sup>17</sup>

Perhaps the question most often asked by patients after they receive their dentures is how to clean them, especially resilient reline materials. There are two essential issues at hand. The first is that based on the issues of colonization, it would appear that regular

cleansing of the dentures would be prudent, using the proper chemistries. In addition, these microbes, if left unattended, can contribute to a variety of health problems including the development of pneumonia<sup>18</sup> via frank respiratory pathogens,<sup>19</sup> pharyngeal colonization resulting in same,<sup>20</sup> and stomatitis (*Candida* infection),<sup>21</sup> among others.

An analysis was conducted to evaluate the effect of certain denture cleansers (Polident® and Cleadent®) on “*Candida albicans* biofilm formation over resilient liners and to evaluate compatibility between resilient liners and denture cleansers.”<sup>22</sup> The surface roughness of a standard acrylic denture base (control) and the reline materials (COE-SOFT™, acrylic resin, GC RELINE™, and SOFRELINER TOUGH™) were evaluated after long-term immersion in these cleansers. “The binding levels of *C. albicans* were significantly decreased in the following order: COE-SOFT™, GC RELINE™, SOFRELINER TOUGH™, and acrylic resin.”<sup>22</sup> Further studies have shown the efficacy of citric acid as a significant agent in the reduction of denture adhering microorganisms. Faot et al. attempted to determine the efficacy of citric acid denture cleansers on their reduction of *C. albicans*.<sup>23</sup> This in vitro study determined that, in fact, citric acid was a significant reducer in *C. albicans* biofilm accumulation and cell viability. In a report that evaluated the effectiveness of antibacterial (*Strep. pyogenes*, *Staph. sp.*, *Strep. mutans*, *Actinomyces viscosus*) and antifungal (*C. albicans*) using a denture cleanser containing citric acid (Cleansadent Crystals, drdentalsolutions.com), it was determined that the reduction/kill rate reached nearly 100% for all pathogens.<sup>24</sup>

### THE HARD RELINE: CASE HISTORY

In this case, the patient presented with the chief complaint of an ill-fitting upper denture that was causing her gums to hurt. In addition, the denture had a persistent odor, and her jaws were sore after chewing.

### Diagnostics

Following a comprehensive examination, it was determined that the tissue-bearing surface of the maxilla was erythematous. The vertical dimension of occlusion was insufficient due to generalized ridge resorption. The tissue-bearing area of the denture had been previously relined, but the reline material was peeling, causing the persistent odor.

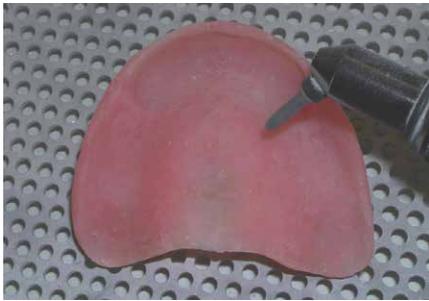


Figure 1

## Treatment

The existing relined material was removed and fresh resin was exposed using a lab bur. Following this, air abrasion with aluminum oxide powder was used to microetch the resin.

Figure 2



This last step is not required but does help to enhance the adhesion of the new relined material. The prosthesis was rinsed, dried, and a relined adhesive (Tokuso Rebase II Adhesive, Tokuyama Dental) was applied in two coats to all areas of the denture to be relined.

Figure 3



Once dry, a separating medium such as petroleum jelly was applied to all areas where relined adhesion was not desired.

Figure 4



Once completed, the hard denture relined powder and liquid were mixed (Tokuyama Rebase II) and dispensed onto the denture intaglio.

The denture was then inserted against the upper arch and the patient instructed to gently bite until the correct vertical dimension of occlusion was reached. As the resin began to harden, the necessary treatment of the muscles was performed to properly mold the borders. When the resin became harder than paste, the denture was removed from the patient's mouth and any excess material trimmed. The denture was then inserted in the patient's mouth until final hardening was complete. Once cured, any remaining flash (Figure 5) was removed and the flanges contoured with a series of lab burs (Komet Dental) and polished (Figure 6).

**When the resin became harder than paste, the denture was removed from the patient's mouth and any excess material trimmed.**

Figure 5



Figure 6



## Tokuso Resin Hardener II<sup>®</sup> was dissolved in water at 104-140°F and the denture was completely immersed in this bath for three minutes.

To complete hardening of the cured denture reline, a hardener was used. Tokuso Resin Hardener II<sup>®</sup> was dissolved in water at 104-140°F and the denture was completely immersed in this bath for three minutes. This improves the surface hardness and final polish of the denture base by curing the air inhibition layer of the tissue-bearing surface. The denture was then removed, rinsed, and polished.

Figure 7



The procedure of relining is not complete unless a number of issues are addressed. These include the evaluation of fit and stability, esthetics, phonetics, occlusion (Figure 8), and finally, giving the patient home-care instructions.

Figure 8



### THE SOFT RELINE

The most common type of failure with soft, primarily silicone relines is the adhesion between the silicone reline material and the denture acrylic base. In a study published by the *Journal of Applied Oral Science*, it was determined that the use of a specialized primer (Sofreliner<sup>®</sup>, Tokuyama Dental) increased the bond strength between the acrylic resin denture base and the silicone reline material.<sup>25</sup>

Another area of concern is the tear strength of silicone liners. Santawisuk et al. studied the dynamic viscoelastic properties of experimental silicone soft lining materials.<sup>26</sup> Results showed that the silicone elastomers demonstrated acceptable dynamic viscoelastic properties to be used as denture soft lining materials. The resiliency of soft reline materials is also of concern, especially since patients tend to use denture cleansers on a daily basis. However, this had no effect on the hardness of the resilient denture liners evaluated after two years of in vivo simulated conditions of hygiene. Sofreliner<sup>®</sup> was the smoothest material before and after all treatments.

### THE SOFT RELINE: CASE HISTORY

In this case, the patient presented with a request for a soft liner for his lower denture. His goal was increased comfort, chewing ability, and improved fit to his lower jaw.

#### Diagnostics

Following a comprehensive examination, it was determined that the tissue-bearing surface of the mandible was sore to palpation in various areas. The remainder of the exam was within normal limits.

#### Treatment

Approximately 2-3 mm of acrylic was removed from the tissue-bearing surface of the lower denture, and the flanges were prepared with a 90° lip (Figure 9). This provides the reline with sufficient thickness to prevent tearing and peeling and allows enhanced comfort against the vestibule. The prosthesis was rinsed, dried, and a reline adhesive was applied in multiple coats to the newly exposed acrylic (Figure 10) (Sofreliner Tough<sup>®</sup>, Medium Viscosity, Tokuyama Dental, Tokyo, Japan). A separating medium was not necessary as the excess reline material was easily removed with a scalpel and scissors, as well as specially designed cutting burs and polishers. Once dry, the Sofreliner<sup>®</sup> was injected onto all adhesive surfaces (Figures 11,12), and the denture was inserted onto the lower arch (Figure 13). The patient was instructed to gently bite until the correct vertical dimension of occlusion was reached. As the silicone liner begins to set, minimal muscle manipulation is required, and this is particularly true in the lower arch. Once set, excess material and flash was removed using scissors, scalpel (Figure 14), and specialized burs as previously mentioned. The denture was then delivered (Figure 15).

Figure 9



Figure 13

Figure 10



Figure 14

Figure 11



Figure 15

Figure 12



**CONCLUSION**

According to R. Sarka, "Complete dentures are an all-inclusive, full-mouth reconstruction that functions in a dynamic, anatomically sensitive, and demanding environment. They are a singular reconstruction that simultaneously restores function, esthetics, phonetics, facial support, and patient self-esteem."<sup>27</sup>

Understanding this, it is no wonder so many dentures become ill-fitting. The challenges are many and the solutions complex. However, it is the task of our profession to provide our patients with functional, comfortable, and esthetic removable prostheses. Chairside denture relining is a highly effective, successful treatment that can achieve these goals.

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Dr. Ian Shuman maintains a full time general, reconstructive and aesthetic dental practice in Pasadena, Maryland. An educator and author, Dr. Shuman is a pioneer in developing advanced, minimally invasive techniques. Dr. Shuman is the Editorial Director of Continuing Education for PennWell Publishing. He is a Master in the Academy of General Dentistry, an Associate Fellow of the American Academy of Implant Dentistry, and a Fellow of the Pierre Fauchard Academy. Dr. Shuman was named one of the Top Clinicians in Continuing Education since 2005 by Dentistry Today. Dr. Shuman's mission is to teach dental professionals current methods for creating beautiful, long lasting restorations that preserve the maximum amount of tooth structure.

## AUTHOR DISCLOSURE

*Dr. Ian Shuman has no commercial ties with the sponsors or the providers of the unrestricted educational grant for this course.*

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## QUESTIONS

1. In a study of defective dentures by Hummel, the most prevalent single defect was:
  - a. Lack of stability.
  - b. Damaged acrylic.
  - c. Warping of the denture base.
  - d. Lack of adhesion.
2. Occlusal changes can be caused by:
  - a. Excessive chewing.
  - b. Denture tooth wear.
  - c. TMD.
  - d. Porcelain.
3. Tallgren's 25-year study showed that denture wearers have continued bone loss over the years resulting in a decrease in bone:
  - a. Height and width.
  - b. Density and vasculature.
  - c. Thickness and support.
  - d. Volume and density.
4. A biofilm of candida albicans will occur in areas where:
  - a. The reline does not adhere.
  - b. The material is smooth.
  - c. There is polished metal.
  - d. The reline is fixed.
5. A chairside denture reline is needed most commonly for:
  - a. Immediate dentures.
  - b. Implant healing.
  - c. Following any type of oral surgery.
  - d. None of the above.
6. When selecting a reline material, which one of the following features is not desired?
  - a. Highly polishable
  - b. Low heat generation
  - c. Chemical irritation
  - d. Easy handling
7. With hard reline procedures, a separating medium is applied to which areas of the denture?
  - a. Palatal
  - b. Intaglio
  - c. Denture teeth
  - d. Both a and c
8. With a soft reline, the denture flanges were prepared with a lip of:
  - a. 90°.
  - b. 45°.
  - c. 15°.
  - d. 10°.
9. A separating medium is not necessary for silicone liners, as the excess reline material is easily removed with:
  - a. Nail trimmers.
  - b. Specialized burs.
  - c. Scalpel and scissors.
  - d. b and c.
10. When delivering the denture after relining, which of the following is performed?
  - a. Phonetic evaluation
  - b. Occlusal adjustment
  - c. Home-care instructions
  - d. All of the above
11. The basis of the study by Pun et al. was to evaluate tooth loss based on:
  - a. Partial denture design.
  - b. Tooth position.
  - c. Edentulous ridges.
  - d. b and c.
12. Occlusal changes can be caused by denture tooth wear resulting in:
  - a. Sharp edges.
  - b. Worn, ineffective surfaces.
  - c. Abfraction type cupping.
  - d. None of the above.
13. Carlsson's 1967 studies showed a dramatic loss of bone after a tooth extraction during the:
  - a. first year.
  - b. fourth year.
  - c. first five years.
  - d. first month.
14. According to a study by Unger, the mean change in the vertical dimension of occlusion after 20 years of wearing complete dentures was:
  - a. 1.5 mm.
  - b. 2.5 mm.
  - c. 3.5 mm.
  - d. 4.0 mm.
15. Which of the following researchers stated: "The continuous bone loss in the anterior mandible had a significant relationship to the reduction of the anterior face height"?
  - a. Karkazis and Lambadakis
  - b. Carlsson
  - c. Unger
  - d. Osathananda
16. Other methods to improve the bond strength between hard reline resins and denture base resin have been attempted including the use of:
  - a. Air abrasion.
  - b. Dichloromethane.
  - c. Ethyl acetate.
  - d. All of the above.
17. Areas with poor reline adhesion or roughness are potential sites for the development of:
  - a. Amebiasis.
  - b. Trichomonas.
  - c. Candidiasis.
  - d. Leishmaniasis.
18. A study was conducted between resin and silicone liners measuring the presence of candida, demonstrating that resin surfaces presented sharp valleys and depressions, while silicone-based specimen surfaces exhibited more:
  - a. Gentle features.
  - b. Sponginess.
  - c. Absorption.
  - d. Adsorption.
19. The procedure of relining is not complete unless a number of issues are addressed, including:
  - a. Evaluation of fit and stability.
  - b. Esthetics and phonetics.
  - c. Occlusion.
  - d. All of the above.
20. In the clinical case demonstrating the hard reline, as the resin began to harden, what should be performed?
  - a. Border molding
  - b. Bench curing
  - c. Water bath
  - d. a and c
21. A study by Landayan et al. evaluated the toxicity of soft reline denture materials when exposed to:
  - a. Horse serum.
  - b. Candida albicans.
  - c. Mouse fibroblasts.
  - d. Human fibroblasts.
22. A study by Altinci et al. evaluated the antimicrobial effects by mixing denture reline materials with:
  - a. Benzalkonium chloride.
  - b. Quaternary ammonium compounds.
  - c. Potassium perborate.
  - d. b and c.



