Antibacterial Effect of a Temporary Cement–Dissolving Liquid

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Purpose: Methods for removing temporary cement with an antibacterial effect might improve prosthetic treatment prognosis. ***Materials and Methods***: Three removal methods were assessed: *(1)* immersion of an acrylic provisional restoration in a temporary cement dissolver (Temp-off); *(2)* mechanical removal with a dental explorer; and *(3)* sandblasting. Two temporary cements, one with eugenol (Temp-Bond) and one without eugenol (Temp-Bond NE) and of two thicknesses (100 µm and 250 µm), were examined. ***Results:*** Immersion in Temp-off produced the most effective bacterial count decrease compared to the other methods ($P < .05$). No significant difference was found between the two cement types, although the decrease in count was more evident in the thicker (250 µm) cement layer. ***Conclusion:*** Temp-off dissolving liquid used for removal of temporary cement exhibited an antibacterial effect and nonmechanical cleaning ability. *Int J Prosthodont 2018;31:456–458. doi: 10.11607/ijp.5840*

The surface of a provisional acrylic restoration is a potential site for bacterial adherence,[1] primarily for *Streptococcus mutans* (*S mutans*), which is associated with dental caries.[2] The presence of such bacteria in the provisional-abutment interface may cause caries, which compromise abutment longevity[3] and risk treatment success. Temporary cement is routinely removed during prosthetic treatment, and with an added antibacterial component, cement removal might improve treatment prognosis in a routine, cost-effective, and simple way. The present study compared the effect of three cement removal methods on the viable bacterial cell count measured from the inner surface of provisional acrylic restorations: *(1)* immersion of the restoration in a dissolving temporary cement solution (Temp-off, S-C); *(2)* mechanical removal with a dental explorer; and *(3)* sandblasting. The influence of cement thickness (100 µm, 250 µm) and cement type (zinc oxide with or without eugenol) was also examined.

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Materials and Methods

A total of 30 provisional acrylic poly(methyl methacrylate) (PMMA) restorations (ZirconZahn) were milled (M5, ZirkonZahn) to fit standardized maxillary first molar dies (UR62C, Nissin). Two milled groups of 15 restorations each were prepared, one group allowing 100-µm cement thickness and the other 250-µm thickness. Restorations were autoclaved and cemented to the dies (Temp-Bond cement, Kerr). Testing was first carried out with Temp-Bond E cement, and then with Temp-Bond NE cement (with and without eugenol, respectively).

Bacterial Challenge

Each cemented provisional restoration was placed in a test tube containing Brain Heart Infusion (BHI) (Difco Laboratories), inoculated with 5 mL *S mutans* (ATCC 27351) suspension (log phase, adjusted to OD650 nm, = 1, ~106 CFU/mL), and incubated at 37°C for 24 hours. After incubation, the provisional restorations in each group were removed from the dies, and the cement was fully removed using one of the three removal methods (n = 5 per method).

Antibacterial Effect Evaluation

After removal of the Temp-Bond E cement, the margins of each provisional restoration were brought in contact with a blood agar plate for 5 seconds. Then, the restoration was inserted in a test tube containing 1 mL phosphate-buffered saline (PBS) and sonicated for 15 minutes. Serial dilutions were made to determine viable cell count (CFU/mL). Scanning electron microscopy

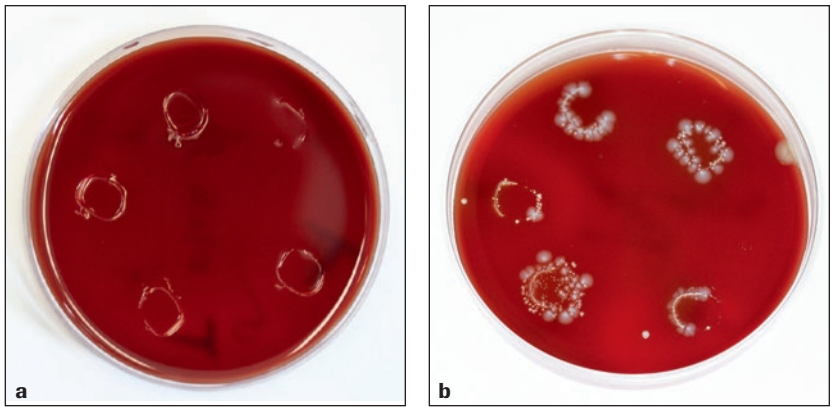

Fig 1 Degree of bacterial growth. Provisional restoration margins brought in contact with blood agar plates. **(a)** Representative view of cement removal with Temp-off. No bacterial growth is seen. **(b)** Representative view of cement removal with sandblasting or an explorer, showing bacterial growth.

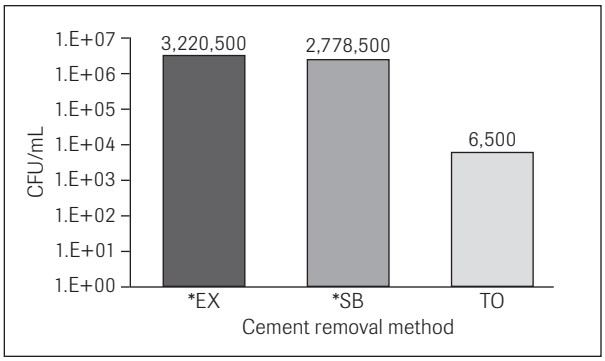

Fig 2 Viable bacterial cell count (CFU/mL) for the different cement removal methods. Cement removal with Temp-off (TO) showed a reduction of up to 4 logs in CFU/mL vs cement removal with an explorer (EX) or sandblasting (SB). *$P < .05$ between-group difference.

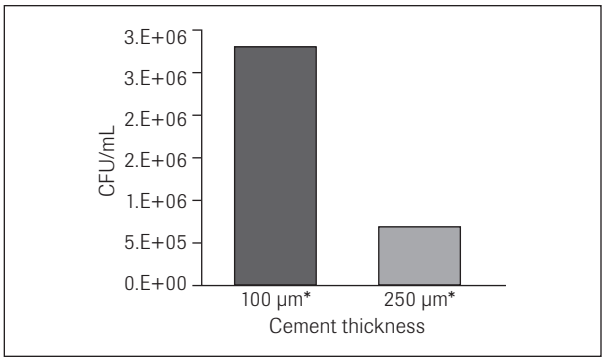

Fig 3 Viable bacterial count (CFU/mL) for 100-µm and 250-µm cement thickness. Restorations with 250-µm thickness showed a greater reduction in CFU/mL than restorations with 100-µm thickness. *$P < .05$ between-group difference.

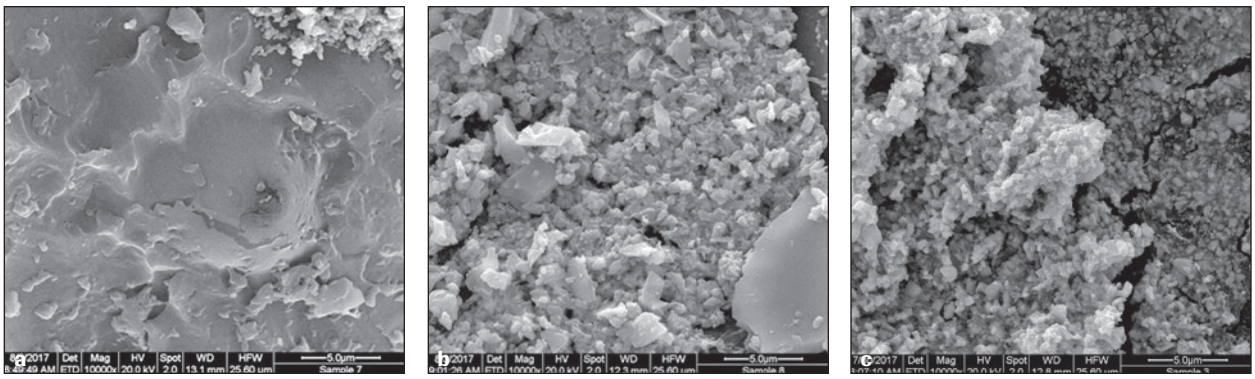

Fig 4 Typical scanning electron microscopy (SEM) of the inner surface of three restorations after cement removal according to the three methods in the 100-µm thickness, Temp-Bond E group. A smaller number of *S mutans* is evident in the **(a)** Temp-off sample vs the **(b)** sandblast and **(c)** explorer samples.

(SEM) of the provisional restorations' inner surface was used to depict the bacterial distribution. A similar protocol was applied to Temp-Bond NE cement.

Results

Provisional restoration margins immersed in Temp-off and then placed on agar showed no bacterial growth (Fig 1). This cement removal method resulted in a significant reduction in viable cell count compared to the other methods (Fig 2). Restorations allowing 250-µm cement thickness showed a significantly lower viable cell count compared to the 100-µm thickness cement ($P < .05$) (Fig 3). There was no significant difference between the two cement types used (Temp-Bond with/without eugenol). SEM showed fewer bacterial structures following cement removal using Temp-off (Fig 4).

Discussion

The use of Temp-off dissolving liquid to remove temporary cement from a provisional acrylic restoration resulted in the most effective bacterial count reduction compared to the other methods. The results were even more evident when the cement was of 250-µm thickness. Temp-off dissolving liquid is composed of ethanol amine, Triton X-100, and potassium hydroxide (KOH), and its antibacterial effect may be explained by its components' properties. Triton X-100, a nonionic surfactant, is a detergent used often in the laboratory to lyse cells or to permeabilize live cell membranes.[4] Also, the thorough, high-quality nonmechanical cleaning may be responsible for the completely smooth removal of the cement and the significant bacterial count reduction on the inner surfaces of the acrylic provisional restorations.

Provisional acrylic restorations allowing a thicker cement layer (250 µm) showed a significantly lower viable cell count. The thicker cement layer came off more easily and in a more unified manner, reducing the rubbing repetitions. In general, mechanical rubbing or sandblasting roughens the restoration's inner surface and may embed additional bacteria in the provisional crown walls.[5]

The present study has the limitations of an in vitro setting and small study groups, but the promising results encourage further studies of this material.

Conclusions

The present results indicate that using Temp-off dissolving liquid for removal of temporary cement exhibited an antibacterial effect and nonmechanical cleaning ability.

Acknowledgments

The authors report no conflicts of interest.

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Literature Abstract

Oral Appliances for Managing Sleep Bruxism in Adults: A Systematic Review from 2007 to 2017

This review focuses on the last decade of research on the use of various oral appliances (OAs) in the management of sleep bruxism (SB) in adults. Sixteen (n = 16) papers of 641 identified citations involving 398 participants were included in the review. Of them, seven were randomized controlled trials (RCTs), seven were uncontrolled before-and-after studies, and two were crossover trials. Analysis of the included articles revealed a high variability of study designs and findings. Generally, the risk of bias was low to unclear for RCTs and high for crossover studies, while the before-and-after studies exhibited several structural limitations. Nine studies used polysomnography, polygraphy, and/or electromyography for SB diagnosis, while others used history taking and clinical examination. Most of these studies featured small samples and were short term. Of the studies using objective SB evaluations, eight showed positive results for almost every type of OA in reducing SB activity, with a higher decrease for devices designed to provide a certain extent of mandibular advancement. Of the studies using subjective SB evaluations, one demonstrated a significant reduction in SB activity, and an additional two showed a myorelaxant effect of OA in SB patients. Although many positive studies support the efficacy of OA treatment for SB, accepted evidence is insufficient to support its role in the long-term reduction of SB activity. Further studies with larger samples and sufficient treatment periods are needed to obtain more information for clinical application.

Jokubauskas L, Baltrušaitytė A, Pileičikienė G. *J Oral Rehabil* 2018;45:81–95. **References:** 60. **Reprints:** Laurynas Jokubauskas, laurynas.jokub@gmail.com —*Brian Fitzpatrick, Australia*