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“Monday Morning Pearls of Practice by Bobby Baig”

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Salivary contamination and effect of bond strength of zirconia. “Decontamination recommended methods”:

Introduction:

1. Zirconia-based restorations have increased in prevalence over the past 6 years due to increased demand for tooth-colored restorations, improvements in ceramic technology, reduced laboratory costs for ceramic fabrication, and the ease of milling zirconia..
2. A recent meta-analysis concluded that optimal bonds to zirconia were obtained by using resin-based cements. (Inokoshi et al 2014)
3. A practical obstacle encountered while bonding to zirconia restorations, however, is that salivary contamination during try-in of the restoration can weaken the bond to the resin cement.
4. With feldspathic porcelain or glass ceramic materials, the inside of the restoration was cleaned with 37% phosphoric acid, following salivary contamination.
5. The acid removed the contaminants and returned bond strength values to their original values.
6. Recent studies have suggested that applying phosphoric acid to surfaces of zirconia, however, leaves a phosphorous residue that impairs the bond strength to resin cement.(Phark et al 2009)
7. Other cleaning methods, such as washing with an organic solvent or alcohol, have been reported in the literature as largely ineffective.
8. Particle abrasion effectively removes contaminants and restores bond strength to its original values. However, there is no consensus as to the effect of particle abrasion on the strength of zirconia.

MDP Monomer and Zirconia Bonding:

1. To improve the resin/zirconia bond, primers containing phosphate monomers, such as 10-methacryloyloxy decyl dihydrogen phosphate (MDP), are often used.
2. In some clinical situations the practitioner will contaminate the zirconia restoration following MDP primer application. In this scenario, efficient cleaning methods have not been examined.
3. MDP is a bi-functional monomer with a phosphate-based functional end that bonds to zirconia and a methacrylate-based functional end that bonds to resin cements.
4. Application of an MDP primer to the surface of zirconia should expose the hydrophobic methacrylate ends

of the bound MDP molecules.

5. Increasing the hydrophobicity of the zirconia surface will reduce wetting of the zirconia by saliva, which is composed of 99% water.

Pattarkia Angkasith & John Burgess et al: Cleaning methods for zirconia following salivary contamination: 2015
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This study investigated the resin bond strength to zirconia following salivary contamination

- A) After cleaning with water.
- B) Phosphoric acid,
- C) Ivoclean,
- D) Particle abrasion.

Results:

1. This study confirmed that salivary contamination of zirconia significantly decreases the bond strength between MDP coated zirconia and methacrylate-based resin materials
2. After particle abrasion, the protein residue cannot be removed through application of water spray alone, as evidenced by the low bond strength.
3. If the MDP primer is applied prior to salivary contamination, however, water spray is able to return the bond strength to its original value.
4. The results show that application of the MDP primer made the zirconia surface slightly more hydrophobic, presumably, reducing salivary wetting ability and deposition of organic residue.
5. Previous studies have found even greater contact angles of water on MDP-primed zirconia surfaces.
6. These results suggest that an MDP-coating prior to try-in helped to protect the zirconia from saliva contamination.
7. Ivoclean cleaning prior to MDP application was efficient at reestablishing bond strength to its original value, similar to the results of previous studies.

Salivary contamination before MDP monomer application:

If salivary contamination occurred prior to application of an MDP primer, the resin/zirconia bond strength could be returned to its uncontaminated strength through particle abrasion or application of Ivoclean.

Salivary contamination after MDP monomer application:

If salivary contamination occurred after application of an MDP primer, rinsing with water was the only cleaning protocol that regained the original bond strength values.

Conclusion

Salivary contamination that occurs **prior to the application of an MDP** primer should be cleaned with Ivoclean or additional particle abrasion. In clinical situations where zirconia becomes contaminated **following the application of MDP**, such as intraoral bonding, or when practitioners apply MDP prior to try-in, the bond seems to be restored with **20 seconds of water rinsing**.

References:

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