COMMENTARY

Computer-Aided-Design/Computer-Assisted-Manufactured Adhesive Restoration of Molars with a Compromised Cusp: Effect of Fiber-Reinforced Immediate Dentin Sealing and Cusp Overlap on Fatigue Strength

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Conservation of tooth structure is paramount when restoring posterior teeth. When teeth are substantially compromised due to extensive previous restorations or existing faults such as caries or tooth fractures, the preparation design should allow for maximum reinforcement of the weakened remaining tooth structure. Sometimes, this approach dictates intentionally extending the preparation to increase resistance form, as when capping undermined cusps. Although these extensions may at first glance be perceived as contradictory with the conservation of tooth structure principle, it is in fact to preserve the integrity of the tooth that they are required. This elegant laboratory study by Dr. Magne and colleagues appears to support this thesis.

The authors used an extracted tooth model with standardized preparation features (similar-sized specimens, extensive mesio-occluso-distal (MOD) preparation, undermined palatal cusp, and simulated cusp base crack) to test the effect of one preparation design feature (palatal cusp capping or not) and one restoration feature (use or not of a fiber-reinforced patch as part of the composite resin base used to block the undercut in the palatal cusp) on the fatigue strength of the restored specimens. Immediate dentin sealing, a technique previously introduced and extensively studied by Dr. Magne's group, was used for all specimens, and they were all restored with computer-aided-design/computer-assisted-manufactured (CAD/CAM) composite resin onlays or inlays, depending on the type of tooth preparation. The results indicate that, in general, survival of onlays was significantly higher than that of inlays, while the use of the fiber patch did not increase the fatigue strength of either type of preparation. As the authors note, while all specimens' survival probability at a load of 450 N was 100%, the survival probability of the onlays appears to be higher than that of the inlays for higher loads (Figure 5). Given that the physiological maximum occlusal force in patients can be as high as 900 N as pointed out by the authors, readers will benefit from taking note of this study's results.

A challenge of in vitro research involving dental restorative materials testing their performance is that it is very difficult, if not impossible, to simulate clinical conditions so that the results will have clinical meaning and applicability. Dr. Magne and colleagues should be congratulated by the careful research design and attention to detail in their study, which provide clinicians with helpful information about preparation design for extensive posterior restorations. An important next step for the authors would be to conduct a clinical trial comparing the techniques proposed, to test their hypothesis in an even more clinically relevant environment.

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