EDITORIAL

Current Evidence on the 3D-printed Provisional Restorations

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Provisional restorations are mainly used in dentistry during the time between tooth preparation and the placement of the definitive restorations. Provisional restorations provide function, esthetic, positional stability, and protect the vital prepared teeth and their periodontal tissues.[1] Commonly, the provisional restorations were fabricated with conventional technique. With the advent of digital dentistry, provisional restorations are also being fabricated with computer-aided designing/computer-aided manufacturing (CAD/CAM) milling using subtractive manufacturing techniques.[2] Recently, the three-dimensional (3D) printing technique became popular, which utilizes additive manufacturing techniques and fabricates the prosthesis by adding small increments of the material layer by layer. The 3D-printing methods include stereolithography, selective laser sintering, digital light processing, and fused deposition modeling.[3]

Provisional restorations are subjected to masticatory forces, so they need specific mechanical properties that help them to survive the repeated functional forces of the oral environment. Recently, a lot of research was done to find whether 3D-printed provisional restorations have superior mechanical and physical properties and marginal and internal fit compared to CAD/CAM-milled and conventional provisional restorations.[4–11]

Atria et al.[4] compared the mechanical and biological properties of 3D-printed resins used for provisional dental restorations. They found that following the manufacturer's instructions, 3D-printed provisional resins can be used in clinical settings. The newer 3D-printed resins manufactured for long-term use have shown higher mechanical properties compared to the other materials. Britto et al.,[5] in their study, found that 3D-printed resin had higher flexural strength after aging compared to heat-cured acrylic resin. The cell viability was also higher with 3D-printed resins (92.9%) compared to heat-cured acrylic resin (71.9%). The polymer-based 3D-printing material has adequate biomechanical behavior to be used as provisional restorations.

Marchesi et al.[6] compared the fatigue resistance of three-unit provisional resin restorations fabricated by the 3D-printing method with polymethylmethacrylate (PMMA), which was fabricated by CAD/CAM system. They found that CAD/CAM fabricated PMMA provisional restorations had higher fatigue resistance compared to 3D-printing. Alzahrani et al.[7] had done a systematic review of the mechanical properties of 3D-printed provisional resins. 3D-printed provisional restorations showed higher hardness, less wear volume loss, smoother surfaces, and higher wear resistance compared to either conventional, milled, or both. Jain et al.,[8] in another systematic review, concluded that 3D-printed provisional crown and fixed dental prostheses (FDPs) resin have superior mechanical properties, but inferior physical properties compared to conventional and CAD/CAM milled resins.

Chaturvedi et al.[9] evaluated the marginal and internal fit of provisional crowns made with 3D-printing technology and compared it with compression molding and milling methods. They found that 3D-printed provisional crowns exhibit better marginal and internal fit when compared to milled and molded provisional crowns. Contradictory results were found by Mohajeri et al.[10] in a similar study, where they found that although all methods of fabricating provisional restorations had clinically acceptable marginal gaps, provisional crowns fabricated by the chairside method had smaller marginal gaps. Al Wadei et al.[11] did a systematic review to compare the marginal fit and internal fit of provisional crowns and FDPs made with 3D-printing resins with that of CAD/CAM milling and conventional resins. They found superior marginal fit and internal fit of provisional crowns and FDPs fabricated from 3D-printing resins compared to CAD/CAM-milled and conventional provisional resins.

The currently available evidence shows that the 3D-printed provisional resin materials seem to be a promising treatment option for making provisional crowns and FDPs. 3D-printed provisional resins showed better mechanical properties and marginal and internal fit compared to CAD/CAM and conventional provisional restorations. More research is needed to clarify its physical properties, which seem to be inferior compared to CAD/CAM and conventional provisional restorations.

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