Advancements in Fabrication Techniques for Permanent Dentures A Review of Material and Design Innovations

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Abstract

materials; enabling intricate designs and rapid production. 3D printing is particularly bene cial for creating complex structures and allows for the seamless incorporation of features like embedded reinforcement for durability. e introduction of biocompatible polymers has addressed issues such as allergic reactions and tissue irritation. Materials like polymethyl methacrylate (PMMA) remain popular due to their strength and adaptability. Enhanced formulations now include antimicrobial properties; reducing the risk of infections. Nanotechnology has facilitated the development of materials with improved mechanical properties; such as higher tensile strength and resistance to wear. Nano-

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In od c ion

Permanent dentures are a cornerstone of restorative dentistry; providing patients with a solution to restore function; aesthetics; and oral health following tooth loss. Over the past few decades; technological and material advancements have signi cantly transformed the landscape of denture fabrication. Traditional appthe durability and comfort of dentures [1-5].

is review delves into the advancements in fabrication techniques and materials; emphasizing their clinical and patient-centered bene ts. It also explores the challenges that remain and the potential future directions in this rapidly evolving eld. Traditional denture fabrication relies on manual processes; including impression-taking; casting; and hand-layering of materials. While these methods have stood the test of time; they o en require extensive labor and are prone to variability due to human error. Techniques such as asking and polymerization were standard but have been gradually supplemented or replaced by more advanced methods.

e integration of CAD/CAM technology has transformed how dentures are designed and manufactured. CAD so ware allows for the precise modeling of dentures based on digital impressions; eliminating the need for traditional molds. is is followed by CAM; which uses milling machines to fabricate dentures from high-quality blocks of material. CAD/CAM dentures boast superior t; accuracy; and aesthetics; signi cantly reducing chairside adjustments and remakes. 3D printing has emerged as a game-changer in denture fabrication. is technique builds dentures layer by layer using biocompatible resins or other