Editorial

Application of Nanotechnology: A new era in dentistry

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APPLICATION OF NANOTECHNOLOGY IN DENTISTRY

Nanodentistry is an innovative field of dentistry that has evolved over the years to revolutionize the various specialties of dentistry. It includes the use of nanomaterials, nanorobots, and nanotechnology not only for diagnosing but also for preventing and treating oral diseases. Nanodentistry focuses on achieving precise and targeted delivery of therapeutic and diagnostic agents with nanosized materials within the dimensions of 0.1-100 nm. The applications of nanodentistry are vast, ranging from restorative dentistry to repair cavities, cosmetic dentistry for tooth whitening, orthodontic treatment, nanometals and nanomaterials with improved physical, chemical, and biological properties, nanorobots that can be programmed to perform dental procedures like oral prophylaxis, plaque control, biofilm removal, repair of damaged teeth, nanoirrigants, and nanoparticle-coated dental implants and remineralizing agents, all with superior performance.

Metallic nanoparticles have antibacterial properties; silver nanoparticles can be used as an endodontic irrigant, sealers, restorative materials, remineralizing agents, dental implants, dental aesthetics, dental prosthesis with bioactive, biocompatibility, and antibacterial, antiviral, and antifungal properties. Graphene-based nanoparticles are used in tooth coatings, implants, and biofilm production. Similarly, gold nanoparticles are used in nano drug delivery systems, treating and detecting cancers, as photothermal agents, contrast agents, drug delivery, and osteoinductive agents. Moreover, metal oxide, zinc oxide, titanium dioxide, titania-based, zirconia oxide, aluminum oxide, silicon dioxide, zirconia, silica-based, hydroxyapatite-based nanoparticles are other nanotechnology utilized in dentistry.[3-5] Nanotechnology has a vast implication in operative dentistry, also known as operative nanodentistry, that utilizes bioactive substances like hydroxyapatite, fluorapatite, chitosan nanoparticles, nanohydroxyapatite, and nano-fluorapatite[6].

The field of prosthodontics is also equally influenced by nanotechnology. Prosthetic rehabilitations and restorations using nanotechnology include complete dentures manufactured from polymethyl methacrylate resins (PMMR) with nanoparticles of Ag, ZrO_2, and TiO_2 used successfully to treat denture stomatitis, enhance flexural strength and antimicrobial property, boost viscosity, and reduce porosity of the resin. Similarly, carbon nanotubes have been used with PMMR to reduce polymerization shrinkage and to enhance mechanical properties. Impression materials like vinylpolysiloxanes with nanofillers enhance the

hydrophilic characteristics and flow properties of impression materials, forming a voidless impression with better models and margins. Stain and wear resistant nano-composite teeth for dentures, nanocare gold to enhances antimicrobial and adhesive properties while cementation, nano ceramics with high toughness and ductility, nanomodifies incorporated luting agents, nanoceramics and nanopolymers coated nano titanium dental implants with increased interfacial attachment and better healing are some of the examples on incorporation of nanotechnology in the prosthodontics.[7-10]

Nanotechnology has a vast implication in dentistry. It has been found to be fundamental in the development of material science and clinical technology in the field of prosthodontics with enhanced physical, chemical and biological properties. Hence, nanotechnology is defining the new era in dentistry.

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