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ANTIMICROBIAL ACTION OF A MODIFIED UNIVERSAL ADHESIVE: AN IN VITRO STUDY

Abstract:

Background: Resin composites and dental adhesives are widely used to restore carious teeth. A relatively new category of the dental adhesives, the universal adhesives (UAs) is considered user friendly because of its simplicity to use and compatibility with any adhesive strategy. However, the adhesive interface created by these adhesives is highly susceptible to cracking after polymerization which in turn facilitates the initiation of secondary caries.
Objectives: The present study was set to evaluate the antimicrobial action of All Bond Universal Adhesive after modifying it with chitosan capped cerium nanoparticles (C-CeNPs) against *S. muatns* and *L. acidophilus*.
Materials and Methods: A colloidal suspension of C-CeNPs was synthesized, characterized, and incorporated into the universal adhesive. Two groups of adhesives were used: G I without C-CeNPs and G II with 3% by weight of C-CeNPs. The antimicrobial action of G I and G II was evaluated by agar diffusion test (ADT) and direct contact test (DCT) at 1, 7, and 14-day time intervals.
Results: For ADT, G II resulted in larger inhibition zones against both microbial strains than G I. The inhibition zones for G I and G II where larger against *S. mutans* than *L. acidophilus*. For the DCT, less colony forming units (CFU) of both microbial strains were formed in regard to G II than G I. The number of CFU of both microbial strains increased in line with the time intervals.
Conclusions: Incorporating C-CeNPs into the universal adhesive increased its antimicrobial action against *S. muatns* and *L. acidophilus* microbial strains.

mutans and *L. acidophilus* which eventually leads to secondary dental caries [8,9].
Different antimicrobial agents have been added to UAs adhesives to impart them antimicrobial action with different outcomes observed [10]. A recent study has found that doping an orthodontic adhesive with cerium oxide nanoparticles enhanced its antimicrobial action against *S. mutans* [11]. However, keeping nanoparticles well- dispersed into a suspension is a major issue since nanoparticles tend to agglomerate into clusters of several microns [12]. The agglomeration of nanoparticles can be minimized if suitable capping agents are used [13]. Various capping agents, such as surfactants, tiny ligands, polymers, dendrimers, cyclodextrins, and polysaccharides, have been utilized in the synthesis of nanoparticles [14]. Chitosan is a co-polymer comprising d-glucosamine and N-acetyl-dglucosamine produced via alkaline deacetylation of chitin naturally occurring in the crustaceans or hydrolysis of chitin by the enzymatic action of deacetylase [15]. Chitosan has been used as a capping agent to stabilize the colloidal dispersion, and to control the morphology and optical properties of metal nanoparticles including gold [16], silver [17], and copper [18]. Regarding biological applications, chitosan has excellent properties like biocompatibility, biodegradability, non-toxicity, and antimicrobial activity [19]. Different modalities have been tried to overcome this issue and provide antimicrobial activities, including resin and seashell [20,21].