International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 16s,2025
https://theaspd.com/index.php

Comparison Of Prevention Of Denture Stomatitis By Application Of Surface Sealant Vs Without Surface Sealant Application: A Scoping Review

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Abstract
Oral infections, especially denture-induced stomatitis, usually occur due to contact between biofilm rich in Candida albicans formed on the inner surface of complete dentures and the mucosa. The treatment of denture-induced stomatitis includes denture cleansing and disinfection in addition to topical or systemic antifungal drugs. Although these treatments do show some efficacy, they aim to inactivate the microorganisms after denture surface colonization. As the adhesion of microorganisms to denture surfaces is a prerequisite for microbial colonization, the development of methods that can reduce C. albicans adhesion may represent a significant advance in the prevention of denture-induced stomatitis.
This study investigated historical advances in the prevention of denture stomatitis by altering the intaglio surface of acrylic dentures with different surface sealants or coatings and identifying gaps in literature.
Keywords: *Denture Stomatitis, Denture- Induced Stomatitis, Surface Sealants, Acrylic Resin, Candida Albicans*

INTRODUCTION

A dental prosthesis objective is to improve the patient's appearance, functionality, and quality of life by replacing some or all of their lost teeth together with the structures that surround them, thus rehabilitating the entire stomatognathic system. Maxillary complete dentures are commonly associated with denture-induced stomatitis characterized by inflammation and erythema of submucosa due to the association of Candida Albicans with the prosthesis placed intraorally, leading to biofilm formation. Biofilm is composed of mucin, proteins, and mucopolysaccharides with increased quantities of Candida albicans species. Denture fabricating materials (acrylic resins) are prone to biofilm formation due to hydrophobicity (decreased affinity to water and increased affinity to bacterial colonization), porous nature, surface roughness, and residual monomer content.Treatment of denture-induced stomatitis includes utilizing photobiomodulation therapy (low-level laser therapy) for treatment of inflammation or erythema of submucosa, antifungals like nystatin, amphotericin B, and ketoconazole[1]. Although less frequently utilized products containing organic acids, titanium dioxide, and inorganic silver antibacterial agents' incorporation in acrylic resin prevent bacterial adhesion, thus preventing denture stomatitis. These surface modifications are being done with the purpose of reducing the biofilm accumulation on the intaglio surface of the prosthesis. The University of Western Ontariostudied the role of saliva in candidal colonizationand found that within seconds of oral surface exposure to saliva, the initial phase of pellicle formationoccurs on the denture base, during which precursor proteins like statherinsadhere to the surface, forming a 10-20 mmthick protein layer. These salivary proteinscontrol the adhesion of Candida albicans to polymethyl methacrylatebecause they are responsible for the development of acquired pellicle**.** Pavithra et al.suggested that acrylic resin wets with water and more with saliva, as it adsorbs mucopolysaccharidesand proteins from saliva[2].Matheus et al.stated that salivary protein adsorptionis dependent on electrostatic forcesand material hydrophobicity. Thus, if the properties of acrylic resin, like hydrophobicity or electrostatic forces,are altered, then it might lead to a decrease in the salivary protein adsorption, which are the precursors for the candidal growth on the denture base, ultimately leading to denture stomatitis. There have been articles in which it is stated that surface sealants increase the smoothness, but it cannot withstand the exposure to sodium hypochlorite during disinfection.

Thus, in this article, a scoping review is being conducted with the purpose of analyzing the role of surface sealants in preventing the candidial colonization on acrylic resin , thereby preventing denture stomatitis.

Review Question

To evaluate the role of surface sealant application on the intaglio surface of the denture in preventing denture-induced stomatitis.

Inclusion criteria

Population: Completely edentulous patients wearing complete dentures with or without denture-induced stomatitis.

Content: Comparison of prevention of denture-induced stomatitis between complete denture wearers with surface sealant coating and without surface sealant coating.

Context: Manav Rachna Dental College, Faridabad

Types of sources

Numerous experimental and quasi-experimental study designs, such as interrupted time-series studies, randomized controlled trials, and non-randomized controlled trials, were considered in this scoping review. Additionally, prospective and retrospective cohort studies, analytical cross-sectional studies, case-control studies, and other analytical observational research were taken into consideration for inclusion.

Search strategy

In this review, a three-step search approach was applied. To find pertinent literature on the subject, a preliminary search of Google Scholar and MEDLINE (PubMed) was conducted. The index keywords used to find the articles and the key phrases in the titles and abstracts of pertinent publications were combined to create a thorough search strategy.

Study or source of evidence selection

After the investigation, duplicates were eliminated, and all citations found were gathered and entered into the bibliographic program. After a pilot test, two or more independent reviewers assessed the titles and abstracts to determine whether they matched the review's inclusion criteria. Two or more independent reviewers extensively evaluated the complete text of chosen publications pertaining to the inclusion criteria. The scoping review excluded full-text evidence sources that did not fall in accordance with the inclusion criteria. At every step of the selection process, the reviewers spoke or conferred with one or more additional reviewers to settle any differences that came up. The final scoping review provides a detailed report on the search and study inclusion process outcomes[3].

RESULTS

AUTHOR	YEAR OF PUBLICATION	ORIGIN OF STUDY	AIM OR PURPOSE OF STUDY	STUDY POPULATION & SAMPLE SIZE	METHODOLOGY OR METHODS	INTERVENTION & OUTCOME MEASURES	KEY FINDING RELATED TO RESEARCH QUESTION.
1. Silvia M 4et al	2016	Brazil	The efficiency of two commercial composite surface sealants (Surface Coat_ and Biscover_	Sample size: 140 Invitro study	Four groups of surface treatments were tested: rough surfaces treated with Biscover_ LV, rough surfaces treated with Surface	Surface Coat_-treated surfaces performed similarly to rough surfaces in all solutions and cycles, while Biscover_ LV-treated surfaces were as effective and had the same surface integrity as smooth surfaces.	By applying Biscover LV surface sealant, denture-induced stomatitis was avoided. Biscover LV is more successful at preventing

			LV) in lowering the colonization of C. albicans biofilm on denture resin was examined in this study.		Coat, rough surfaces treated with 0.3 lm of mean roughness (Ra), and smooth surfaces [0.3 lm of Ra].		denture stomatitis than Surface Coat surface sealer.
2. Azuma 5et al	2012	Tokyo Japan	This study set out to assess how a denture base material's resistance to Candida albicans adhesion was affected by a silica coating.	5 specimens per group.	Polymerization of acrylic denture lining material was used to create the specimens. A silica coating agent was applied to the coated group specimen three times, and contact angle measurement, scanning electron microscopy, and energy dispersive X-ray spectroscopy were used to assess the surface characteristics.	The findings imply that the silica coating's hydrophilic surface modification lowers C. albicans adhesion	Increasing the surface hydrophilicity of a denture base material was accomplished successfully by covering it with silica nanoparticles.Hydrophilic surface modification with the silica coating agent decreased C. albicans adherence to the denture basematerial.

3Lazarin6 et al.	2012	Brazil	This study examined the impact of experimental photo polymerized coatings with hydrophilic or zwitterionic monomers on Candida albicans adherence and the hydrophobicity of an acrylic resin used as a denture foundation.		Acrylic specimens were prepared with rough and smooth surfaces and were either left untreated (control) or coated with one of the following experimental coatings: 2-hydroxyethyl methacrylate (HE); 3-hydroxypropyl methacrylate (HP); and 2-trimethylammonium Ethyl methacrylate chloride (T); and sulfobetaine methacrylate (S). The concentrations of these constituent monomers were 25%, 30% or 35%. Half of the specimens in each group (control and experimental) were coated with saliva and	S and HP coatings may be a viable preventive treatment for denture stomatitis because they dramatically decreased the adherence of Candida albicans to the acrylic resin.	The short-term (90 min) attachment of Candida albicans to the denture base acrylic resin was considerably decreased by experimental S and HP coatings, which demonstrated encouraging results.. It is yet to be determined how these coatings affect the long-term development of biofilm. Before these coatings are suggested for clinical usage, their biocompatibility and resistance to chemical (immersion in denture cleansers) and mechanical (brushing) denture cleaning techniques should be examined.

					the other half remained Uncoated. The surface free energy of all specimens was measured, regardless of the Experiment al condition. C. albicans adhesion was evaluated for all specimens, both saliva conditioned and unconditio ned. The adhesion test was performed by incubating specimens in C. albicans suspensions (1 _ 107 cell/mL) at 37 8C for 90 min. The number of adhered yeasts were evaluated by XTT (2,3-bis[2-methoxy-4-nitro-5-sulfophenyl]-5-[{phenylami		

					no}carbonyl]- 2H- tetrazolium- hydroxide) method.		
4. Takahashi7etal	2014	Tokyo, Japan.	Poly-2-methacryloyloxyethyl phosphorylcholine grafting and poly-		Acrylic resin specimens based on PMMA were being made. One group applied a	It was found that the denture base resin polymethyl methacrylate coated with 2-methacryloyloxyethylphosphorylcholine polymer reduces	According to these findings, graft polymerization of 2-methacryloyl

			2-methacryloyloxyethyl phosphorylcholine-co-n-butyl methacrylate coating are two 2-methacryloyloxyethyl phosphorylcholine polymer coating techniques whose durability and anti-adhesive properties are being examined in relation to biofilm formation.		PMB-based coating on PMMA, while another group applied graft polymerization of MPC to PMMA-based acylic resin. Using the biofilm formation assay, the anti-adhesive ability against bacterial colonization was assessed for both groups.	the production of bacterial biofilm.	oxyethyl phosphorylcholine on denture surfaces may increase coating endurance and inhibit microbiological retention.
5.Queiroz 8etal	2012	Brazil	This study aimed to assess the impact of covering poly (methyl methacrylate) (PMMA) with silver nanoparticles doped and undoped diamond-like carbon thin films on the development of	Forty-five PMMA disks were obtained, finished, cleaned in an ultrasonic bath, and divided into three groups: Gc, no surface coating (control	Rutherford backscattering spectroscopy studies, optical profilometry, and atomic force microscopy were used to characterize the specimens and identify variations in their chemical makeup as well as morphological	C. albicans biofilm formation was significantly influenced by the films ($p < 0.00001$), reducing the number of cfu, while not affecting the roughness parameters ($p > 0.05$). The Tukey test showed no significant difference between Gdlc and Gag	An alternate method of preventing candidiasis in denture wearers could involve applying diamond-like carbon films that have been doped or undoped with silver nanoparticles to the base of PMMA-based dentures.

			Candida albicans biofilms.	group); Gdlc, coated with diamond-like carbon film; and Gag, coated with diamondlike carbon film dopedwith silver nanoparticles.	structure. C. albicans (ATCC 18804) biofilm were created by immersing the specimens in 2 milliliters of Sabouraud dextrose broth that had been injected with a standardized fungal suspension after they had been sterilized by γ-ray irradiation. The quantity of colony forming units (cfu) in each specimen was counted after a 24-hour period. ANOVA and the Turkey test were used to evaluate data pertaining to biofilm formation.		

DISCUSSION

The objective of this scoping review was to evaluate the role of surface sealant application on the intaglio surface of the denture in preventing bacterial adhesion, thus preventing denture-induced stomatitis. Five articles were included in the result, which were in vitro studies. On analyzing the results, it could be inferred that coating the intaglio surface of the denture with surface sealant reduced the hydrophobicity,

resulting in the decreased adhesion of Candida albicans, hence preventing denture stomatitis.According to Silvia [4]et al., surface sealants are unfilled, low-viscosity resins that reduce surface roughness and eliminate the surface irregularities on acrylic resin. Candida albicans has a preference for hydrophobic surfaces. By application of surface sealants Biscover LV on the intaglio surface of the denture, the hydrophilic nature of the denture is enhanced, thus preventing the biofilm formation that occurs due to the adherence of Candida albicans. Azuma [5]et al. stated that the main etiological factor for denture-induced stomatitis is the bacterial adhesion on the acrylic resin-fabricated prosthesis. This occurs due to the hydrophobic interaction of bacterial species with the intaglio denture surface. Thus, by hydrophilic surface modification, bacterial adhesion can be prevented. In this study, the author utilized silica nanoparticles dispersed in methanol solvent as a surface sealant and concluded that coating the denture surface with silica nanoparticles prevented the chances of occurrence of denture-induced stomatitis .According to Lazarin[6] et al., there was greater adhesion of Candida albicans to rough surfaces as compared to smooth surfaces. This can be attributed to the fact that surface roughness enhances surface area, which may act as niches for microorganisms, thus favoring adhesion. It was being stated that surface coating with 2-methacryloyloxyethyl phosphorylcholine decreased both water contact angles and the adhesion of Candida albicans. Takahashi[7] et al. further improvised on this topic by stating that 2-methacryloyloxyethyl phosphorylcholine coating on denture base resin polymethyl methacrylate decreases bacterial biofilm formation.According to Quieroz[8]et al., surface modifications might be considered as a good option for preventing microbial biofilm formation. Earlier it was suggested that a rough surface has a larger surface area that increases surface energy and promotes bacterial colonization. But according to the results of this article, roughness had no significant effect on biofilm formation , suggesting that reduced Candida albicans pellicle formation is due to chemical modifications of the PMMA surface, which causes reduced hydrophobicity and hence decreases bacterial colonization.

CONCLUSION

According to different authors and their research , it could be seen that coating the intaglio surface of the denture with surface sealants like Biscover LV, silica nanoparticles dipped in methanol, carbon films, etc., leads to surface modifications in the polymethyl methacrylate. These surface modifications decreased the hydrophobicity of the PMMA surface, leading to decreased affinity of Candida albicans and hence decreased chances of biofilm formation. Hence, it could be concluded that surface modifications of PMMA with surface sealants can be considered a viable option in preventing biofilm formation and hence the occurrence of denture-induced stomatitis.

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