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An Insight into the Journey of Silver Nano Particles Infused to PMMA Resin

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Abstract:- Prevention of inflammation, denture stomatitis and improvement of oral hygiene status can be achieved by adding silver nanoparticles in PMMA. Ag metal has a strong influence on antimicrobial property. This article mainly focuses on the PMMA denture impregnated with Ag nanoparticles that has a greater efficiency to prevent candidiasis growth in denture than the normal PMMA denture, thereby improve the status of oral hygiene. Ag nanoparticles are chemically been reduced to 1µm in size and combined with PMMA. Field emission scanning electron microscope and atomic absorption spectroscopy was used to incorporated nano particles in PMMA .Fluorescence activated cell sorting and thermal gravimetric analyses are used to test antifungal effect. Successfully incorporated Ag Nano Particles has a greater anti adherent effect against candida albicans. Control of fungal colonization and reduction of biofilm formation is highly seen in Ag incorporated PMMA than the unmodified PMMA.

Keywords:- *Silver Nanoparticles; Candida Albicans; Denture Stomatitis.*

I. INTRODUCTION

Silver nanoparticles have antimicrobial property; it has been widely used in medicine. Nowadays, silver nanoparticles (AgNPs) have been introduced, and mixed with various dental materials because of its property [1] [2]. Silver ions (Ag+) are used in dressing of wound, catheters and prostheses [3]. It is also used in dentistry because it is believed that it may reduce the formation of biofilm on surfaces which is exposed to dental material [4]. Silver nanoparticles are used with many materials such as polymethylmethacrylate (PMMA), alginate, implant surfaces, glass ionomer, composite etc…[5][6].This article mainly deals with the effect of intellect silver nanoparticles in PMMA on oral mucosa.

PMMA is widely used for the fabrication of dentures for both partially edentulous and completely edentulous patients. As such PMMA does not contain antimicrobial property and also it is in constant contact with oral mucosa, it may cause irritation because of microbial invasion. [7][8] This article mainly deals with the effect of intellect silver nanoparticles in PMMA and its beneficial effect on oral mucosa.

II. DENTURE STOMATITIS

Dentures made by PMMA have microbial roughness in the tissue surface and it may lead to poor hygiene, xerostomia and fungal infection. This may lead to stomatitis infection in denture wearers. It mostly occurs in the palate. Clinically the affected surface appears erythematous. Majority of the patients wearing dentures suffer with denture stomatitis (about 70%). When the colonization of candida occurs, it leads to the formation of biofilm which plays main role in the causing of denture stomatitis. The treatment includes topical or systemic drugs. Geriatric patients feel difficulties in cleaning their dentures and it may lead to the colonization of candida albicans on the palatal surface than on the buccal mucosa. Candida albicans is yeast and it comes under asexual diploid fungus. This organism associated with denture stomatitis (chronic atrophic erythematous candidiasis or candida associated stomatitis. The unmodified PMMA favor the colonization of candida albicans. So, some authors have dilemma whether the incorporated AgNPs reduces the colonization of candida albicans [9] [10].

A study that was made by Dagistan et al. showed that 78% of people wearing dentures had the positive result for oral candidiasis in which 68% of the cause is because of C. *albicans [11]*

The unmodified PMMA may lead to the colonization of candida albicans. So, some authors have dilemma whether to incorporate the AgNPs to reduce the colonization of candida albicans.

A.F.Waddy made a study by comparing aqueous solution containing AGNPS and modified PMMA. This study is to know whether the incorporated AgNPs reduces the colonization of candida albicans or not. He concluded in his study that solution prepared by using AgNPs showed antifungal activity against C. *albicans* and the modified PMMA with AgNPs showed no effect in the adherence of C. *albicans*. [12]

Acosta-Torres et al made a study by mixing 1µg / mL of AgNPs with PMMA. It showed a smaller number of candida species. Further he used mouse fibroblasts and human lymphocytes to know the activity of PMMA-AgNPs combo. This does not show any cytotoxicity and genotoxicity [13]

Monteiro et al, made a study by mixing AgNPs with acrylic resins in different concentrations by mass like 0.05, 0.5, and 5%. He evaluated that by adding silver particles helps to achieve more antimicrobial effect in oral infections on denture users [14]

Li et al and Monteiro et al made a same study to evaluate the antifungal capacity of AgNPs by merging with nystatin or chlorhexidine digluconate (CHG) in opposition to C. *albicans* and C. *glabrata* biofilms. Finally, they came with the conclusion that it has more antimicrobial effect in the treatment of stomatitis [15] [16].

Nam et al made an in vitro study by mixing PMMA with AgNPs with different weights (0wt%, 5.0wt%, 10.0wt%, 20.0wt% and 30.0wt %). His study reveals that modified PMMA with 20.0wt% gives antimicrobial activity against candida species [17]

III. CONCLUSION

In this review article, we came to know that unmodified PMMA does not have antimicrobial effect against C.*albicans* when compared to modified PMMA with AgNPs have antimicrobial effect against C.*albicans*. This review also reveals that silver nano particles with very minimal concentration do not have antimicrobial property. An optimal concentration of 20.0wt%of AgNPS incorporated PMMA exhibits antimicrobial effect against C.*albicans*. Mostly elder patients feel difficult in cleaning their dentures and due to poor oral hygiene there is a chance for more colonization of C.*albicans* on the tissue surface of the denture base (palate surface). This has been contracted by adding optimal concentration of AgNPS with PMMA.

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