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Antibacterial effect of different concentrations of zinc oxide nanoparticles on bacterial count in internal cavity of the dental implant and teeth sulcus

A Thesis
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By
Dr. Dheyaa Mohammed Jawad M. H
B.D.S

Supervised by

Prof.
Dr. Basima GH. Ali
B.D.S, MS.C.

Prof.
Dr. Abbas S. Al-Mizraqchi
B.D.S., M.Sc., Ph.D.

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ABSTRACT

Background: a new science is Nanotechnology that has the ability to offer a wide range of uses and improved technologies for biological and biomedical applications. It is considered as the production, categorization, and exploration of materials in the nanometer. Oral biofilm defined as matrix-enclosed bacterial population adherent to each other and/or to surfaces or interfaces .A biofilm around dental implant surfaces seems similar biofilm that formed on the natural tooth by Scanning electron microscopy

The colonization of the peri-implant environment can occur within minutes after insertion in addition to the periimplant tissue, microorganisms may leak into the implant-abutment interface or remain trapped inside the implant screw hole causing an area of inflammation at the implant-abutment-bone junction as a result of the bacterial reservoir created at this site known as periimplantitis

Aims of the study: The aim of bacteriological study will measure bacterial count reduction after in vitro application of zinc oxide nanoparticles in different concentration against isolates from internal cavity of dental implant three month following implant placement and isolates from gingival sulcus of natural teeth in comparison with chlorhexidine 2% and solvent (water 3: 1 ethanol 99.9%.). Measure the minimum inhibitory concentration and minimum bactericidal concentration for zinc oxide nanoparticles

Materials and methods: Aerobic and anaerobic bacteria were isolated from sulcus of natural teeth and internal cavity of dental implants after 3 months from implant placement surgery (flapless design) to 6 female age range 30 to 44 years with a total of sixteen implants Different

concentrations of ZnO NPs were prepared to (6, 2, 1, 0.5, 0.25, and 0.1) mg/ml

In this *in vitro* study: Based on disk diffusion method was used to demonstrate the antibacterial activity of different concentrations of zinc oxide nanoparticles to isolated bacteria in comparison to chlorhexidine 2% (positive control) and solvent water 3:1 ethanol (negative control).

The second experiment is agar dilution method was used to study the minimum inhibitory concentration and minimum bactericidal concentration for tested bacteria. Different concentrations of zinc oxide nanoparticles were prepared in solvent and mixed with brain heart infusion agar

Results: Aerobic and anaerobic bacterial isolates were sensitive to concentrations (6, 2, 1, 0.5, 0.25, and 0.1) mg/ml of zinc oxide nanoparticles and in comparison with chlorhexidine 2% and solvent. There is synergistic effect between CHX and 1mg/ml in all agar plates**.** All concentrations when compared with negative control shows highly significant difference.

The minimum inhibitory concentration of zinc oxide nanoparticles for aerobic and anaerobic bacteria maximum plate was (0.05mg/ml) and (0.08mg/ml) that isolated from internal cavity of the implant and the sulcus of the natural teeth while the minimum bactericidal concentration for both tested bacterial group were (0.08mg/ml) and (0.1mg/ml) respectively

Conclusion: This study shown that zinc oxide nanoparticles were effective against bacteria isolated from internal cavity of dental implant and sulcus of natural teeth.

6mg/ml was effective more than chlorhexidine 2%. Zinc oxide nanoparticles were able to inhibit growth and kill the aerobic and anaerobic bacteria