SDM
College of Dental Sciences & Hospital
Dhavalnagar, Sattur, Dharwad - 580009, Karnataka, INDIA
Recognised by Dental Council of India, New Delhi

SHRI
DHARMASTHALA
MANJUNATHESHWARA
UNIVERSITY

An In Vitro Study to Evaluate the Cytotoxicity of Different Concentrations of nano-Graphene Oxide Incorporated into Polymethylmethacrylate

By

DR. GARGI SARMA

Dissertation Submitted to the

Shri Dharmasthala Manjunatheshwara University, Dharwad, Karnataka,

In partial fulfilment

of the requirements for the degree of

Master of Dental Surgery (M.D.S)

in

PROSTHODONTICS CROWN AND BRIDGE

Under the guidance of

Dr. LEKHA K

Department of Prosthodontics Crown and Bridge

Shri Dharmasthala Manjunatheshawara College of Dental Sciences and Hospital

Sattur, Dharwad

2020-2023

ABSTRACT

Introduction: Graphene oxide has also shown to improve mechanical strength when incorporated into dental materials as a filler by generating uniform stress distribution, improved wear resistance, tensile strength, flexural strength and thermal properties. Polymethylmethacrylate resins present good properties, such as low modulus of elasticity, good aesthetics, ease of repair, has low cost and has a relatively fast manufacturing process. However, their poor resistance to wear and tear, polymerization shrinkage, lack of strength under fatigue failure, and the microbial adhesion onto PMMA are a major drawback for their long-term use. Studies have proved that graphene oxide incorporated into PMMA can improve its mechanical properties as well as antimicrobial property. However, cytotoxicity of PMMA at different concentrations of graphene oxide has not been explored yet.

Aim and Objectives: The aim of this study is to evaluate the cytotoxicity of graphene oxide incorporated into PMMA resins at three different concentrations

Materials and Methods: Graphene oxide was incorporated with polymethylmethacrylate heat cure resin in three different concentrations (0.5%, 1% and 2% of graphene oxide). The resultant was then subjected to standard cytotoxicity evaluation test i.e. MTT assay (3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyl tetrazolium bromide). The optical density (OD) value was then measured by Epoch Micro plate Reader. The data obtained during the course of the study was subjected to statistical analysis. Cell survival in each group was compared with that of untreated control group (PMMA without graphene oxide). Data were expressed as a percentage to the control group. The statistical analysis was done using Graph pad prism version 3.02. The results of MTT assay (3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyl tetrazolium bromide) was analysed by using one way ANOVA.

Results: According to the results of ANOVA, there were significant differences among the groups in terms of cell survival percentage ($p < 0.0001$). When all the groups were compared, 2% graphene oxide had significantly decreased cell survival rate when compared to the control group. 1% had slightly less cell survival rate than 0.5% graphene oxide and control group. There is insignificant difference between cell survival rate of 0.5% graphene oxide and control group.

Conclusion: Within the limitations of this study, it can be concluded that 0.5% of graphene oxide can be incorporated with PMMA safely. But increasing the concentrations of graphene oxide arbitrarily more than 0.5% can be cytotoxic.