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Comparative Evaluation of Dimensional Accuracy of Heat Polymerized Polymethyl Methacrylate Reinforced with Titanium Dioxide Nanoparticles and Zirconium Oxide Nanoparticles

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ABSTRACT

BACKGROUND AND OBJECTIVE

Polymerization shrinkage affects the dimensional accuracy and fit of the prosthesis. Many studies in the past have shown to improve the mechanical and physical properties after reinforcing the denture base resin with nanoparticles. The effect of Titanium dioxide and Zirconium oxide nanoparticles on dimensional accuracy of the denture base is not documented yet.

MATERIAL AND METHODS

Conventional heat-cure denture base resin (control) and the polymer reinforced with 5 % ZrO₂ and 1% TiO₂ nanoparticles were prepared and used in this study. Forty five denture base specimens were prepared and divided into 3 groups, group A, group B and group C respectively [n=15]. Each sample was checked for dimensional accuracy, using the travelling microscope. The dimensional changes were measured and all the data were statistically analysed using one way ANOVA and post hoc analysis.

RESULTS


Dimensional changes were least with 5% ZrO₂ NP [0.0648±0.006] followed by 1%TiO₂ NP [0.0834±0.005] and were highest when denture base is without NP reinforcement [0.133078±0.008]. Dimensional changes was least with 5% ZrO₂ NP [0.055178± .0059] followed by 1%TiO₂ NP [0.082422±.0330523] and were highest when denture base is without NP reinforcement [0.131711±.0116] at PPS region. Dimensional changes were least with 5% ZrO₂ NP [0.067356± .0089] followed by 1% TiO₂ NP [0.084556±.0067] and were highest when denture base is without NP reinforcement [0.134444±.0082] at MPS region.

CONCLUSION

According to this study, reinforcement of heat-cured PMMA with ZrO₂ and TiO₂ nanoparticles significantly increased the dimensional accuracy of the denture base resin.

KEYWORDS

PMMA, Polymerization shrinkage, ZrO₂ nanoparticles, TiO₂ nanoparticles, Travelling microscope, Dimensional accuracy, PPS, MPS.

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