

ORIGINAL ARTICLES

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**An in vitro study on the SEM analysis and
microhardness of artificial white spot lesions treated
with magnesium gel and diode laser**

ABSTRACT

Objectives. The objective of the current study is to evaluate and compare the effects of magnesium chloride gel at varying concentrations and diode laser therapy, in conjunction with commercially available 1.23% APF, on the enhancement of microhardness in white spot lesions (WSL) of permanent teeth.

Methods. A total of 42 intact premolars were collected and subjected to immersion in a demineralization solution for four days to induce artificial white spot lesions (WSL). The samples were then randomly assigned to six experimental groups: Group A (Control), Group B (0.5% MgCl₂ gel), Group C (1% MgCl₂ gel), Group D (0.5% MgCl₂ gel and Diode laser), Group E (1% MgCl₂ gel and Diode laser), and Group F (1.23% APF). Surface microhardness was assessed using a Vickers hardness tester, and surface topography was examined using scanning electron microscopy (SEM). The collected data were analyzed using one-way ANOVA, followed by Duncan's post-hoc test, with statistical significance set at $p \leq 0.05$.

Result. No significant differences in microhardness were observed among the treatment groups. The combination of 1% MgCl₂ gel and diode laser resulted in the highest Vickers hardness number (VHN), followed by 0.5% MgCl₂ gel with diode laser, 1% MgCl₂ gel, 0.5% MgCl₂ gel, and 1.23% APF gel.

Conclusion. In permanent teeth, magnesium chloride gel alone demonstrated effects comparable to 1.23% APF gel in enhancing surface microhardness. The diode laser was found to further promote the remineralization of white spot lesions (WSL).