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College of Dentistry



**The Effect of Pre-Photopolymerization Heating of
Different Composite Materials on Class II Restoration
Microleakage**

(A comparative *in vitro* study)

A Thesis

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of Baghdad in partial fulfillment of the requirements for the
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ABSTRACT

Resin composites have been the pinnacle of direct esthetic restorations ever since its discovery. However, it comes with its own disadvantages. Post-operative sensitivity and marginal discoloration frequently occur due to polymerization shrinkage and microleakage, which is the major cause of failure in resin composite restorations. The aim of this study is to evaluate the effects of preheating on micro leakage of three different filler size composites which include Filtek™ Z250 Microhybrid, Filtek™ Z250^{xt} Nanohybrid and Filtek™ Z350^{xt} Nanofilled composites in Class II MO cavity preparation.

Sixty extracted sound human maxillary premolars were collected and a standardized Class II cavity was prepared (3mm buccopalatal width, 3-4mm axial height measured from 1mm above the cemento- enamel junction, and 2mm mesiodistal depth) with occlusal extension 2mm away from distal tooth margin , width 3 mm, 2mm depth, pulpal floor 2-3 mm in each tooth and were randomly divided into three groups, each group consist of 20 teeth, which divided to two subgroup each one consist of 10 teeth.

Group A: The teeth are restored by Filtek™ Z250 micro hybrid universal (n=20);Group A1:Teeth are restored at room temperature($24\pm 1^{\circ}\text{C}$);Group A2:Teeth are restored at preheated temperature($54\pm 1^{\circ}\text{C}$).Group B: The teeth are restored by Z250^{xt} Nano hybrid (n=20);Group B1: The teeth are restored at room temperature ($24\pm 1^{\circ}\text{C}$);Group B2: The teeth are restored at preheated temperature ($54\pm 1^{\circ}\text{C}$). Group C: The teeth are restored by nanocomposite Z350^{xt} restorative nanocomposite(n=20);Group C1: The teeth are restored at room temperature($24\pm 1^{\circ}\text{C}$);Group C2: The teeth are restored at preheated temperature($54\pm 1^{\circ}\text{C}$).

Trying to simulate the clinical situation, all the samples were subjected to thermocycling regime (500 cycles , 5 - 55°C) and mechanical load cycling(An

axial force of 50 N was obtained by using 5 kg weight, this force was delivered in intermittent way to the sample), then blue wax was used to seal the apices of the teeth, finger nail varnish was used to paint samples with 2 coats, leaving a 1 mm margin around the cavity to prevent dye penetration, followed by a dye infiltration by immersing in 2% methylene blue dye for 24 hours. The tooth was sectioned longitudinally and the extent or absence of micro-leakage was determined by the amount of dye penetration along the resin composite-tooth interface using a stereo microscope.

Statistical methods used to analyze and assess the result which include : Kruskal-Wallis test ($p \leq 0.05$) used to detect the significant difference between different groups and Mann-Whitney U-test was conducted for pair-wise comparisons among groups .

From the result of this research , Comparison of microleakage between materials highly significant when compared Micro hybrid with Nano hybrid and with Nano filled at room temperatures ,while comparison between Nano hybrid and Nano filled not significant at room temperatures and at preheating process.

Under the current limitation of the study, preheated composite at 54°C showed the least micro-leakage.