

Thermocycling as a means of inducing mechanical fatigue in dental composites

Contents

The effect of thermocycling on the fatigue behaviour of 5 commercially available dental composites; P50(P)¹, Silux Plus(S)², Heliomolar(H)³, Clearfil Photo Posterior-light activated(CLA)⁴ and Clearfil Posterior-chemically activated(CC)⁵ was investigated. One hundred and ten rectangular bar specimens were prepared for each material and divided into 11 groups of 10 each. Test groups 1-6 were subjected to 0, 250, 500, 750, 1000 and 1000 thermal cycles respectively. Each thermal cycle consisted of 1 minute immersion time of 50 seconds per change. The control groups 7-11 were stored in distilled water at 37⁰c for the equivalent time to complete 250, 500, 750, 1000 and 10000 thermal cycles respectively. All specimens were subjected to a 3 point bend test and loaded at a crosshead speed of 1mm/min on an Instron Testing Machine. The flexural strength of all materials decreases with the number of cycles and length of water storage except for CC where the flexural strength increases during the earlier stages of thermocycling and water storage. The lowest flexural strength was observed in groups 6 and 11. One way analysis of variance showed that Group 1 was significantly different from groups 6 and 11 (P<.05), however the thermally cycled and water storage groups were not different from each other for all materials tested. The decrease in flexural strength of all materials in the water storage groups (7-11) when compared to the 24 hour group (1) is related to weakening of resin-filler interface by hydrolysis. While the decrease of the thermally cycled groups can be attributed to debonding of matrix-filler due to variation in coefficient of thermal expansion. It can be concluded that thermal changes does not reduce the flexural strength of composites.

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The effect of thermocycling on the fatigue behaviour of 5 commercially available dental composites; P50(P)¹, Silux Plus(S)², Heliomolar(H)³, Clearfil Photo Posterior-light activated(CLA)⁴ and Clearfil Posterior-chemically activated(CC)⁵ was investigated. One hundred and ten rectangular bar specimens were prepared for each material and divided into 11 groups of 10 each. Test groups 1-6 were subjected to 0, 250, 500, 750, 1000 and 10000 thermal cycles respectively. Each thermal cycle consisted of 1 minute immersion time of 50 seconds per change. The control groups 7-11 were stored in distilled water at 37°C for the equivalent time to complete 250, 500, 750, 1000 and 10000 thermal cycles respectively. All specimens were subjected to a 3 point bend test and loaded at a crosshead speed of 1mm/min on an Inston Testing Machine. The flexural strength of all materials decreases with the number of cycles and length of water storage except for CC where the flexural strength increases during the earlier stages of thermocycling and water storage. The lowest flexural strength was observed in groups 6 and 11. One way analysis of variance showed that Group 1 was significantly different from groups 6 and 11 (P<.05), however the thermally cycled and water storage groups were not different from each other for all materials tested. The decrease in flexural strength of all materials in the water storage groups (7-11) when compared to the 24 hour group (1) is related to weakening of resin-filler interface by hydrolysis. While the decrease of the thermally cycled groups can be attributed to debonding of matrix-filler due to variation in coefficient of thermal expansion. It can be concluded that thermal changes does not reduce the flexural strength of composites.

1,2 - 3M.USA; 3 - Vivadent, Liechtenstein; 4,5 - Kuraray, Japan

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