Intrapulpal Temperature Rise from Command Setting Glass Ionomer Cements

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Introduction:

Thermo-curing of glass ionomer cements (GIC) may accelerate setting time and benefit pediatric and special needs patients with behavior problems; however, it may also pose a potential risk for pulpal damage if the temperature increase is >5.5˚C. The **purpose** of this study was to determine the intrapulpal temperature increase during thermo-curing to command set high viscosity GIC.

Methods:

Four GIC including Fuji Equia Forte(FE), VOCO Ionostar(VI), Riva Self-Cure HV(RSC), and 3M Ketac Universal Aplicap(3M) were tested. Class I preparations were obtained with 557 bur in groups of extracted, non-carious permanent molars (n=6/group) and filled with GIC, and then were either set by light-curing for 40 seconds or by self-curing following the manufacture instructions. A K-type thermocouple probe was inserted from the roots into the pulp chamber to measure the temperature changes. Starting and peak temperatures between groups were compared using two-tailed Student's *t*-test or ANOVA followed by Tukey's multiple-comparison test**.**

Results:

The average temperature increases during thermo-curing were 3.9°± 0.93, 4.08°± 0.94, 3.03°± 1.17, and 2.28°± 0.51 for FE, VI, RSC, and 3M, respectively; while the average temperature increases during self-curing were 0.52˚±0.25, 1.02˚±0.34, 0.63˚±0.16, and 0.37˚±0.08 for FE, VI, RSC, and 3M, respectively. A significantly lower temperature increase (*P*<.05) was seen with 3M following thermo-curing, compared with FE and VI.

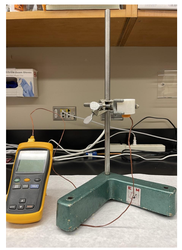

Figure 1. Apparatus used for holding tooth and thermocouple probe.

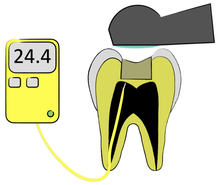

Figure 2. Diagram of how thermocouple probe was inserted from the root to measure temperature change

Thermo-curing may be used for command setting of conventional GIC to accelerate clinical setting time.

Tables & Figures:

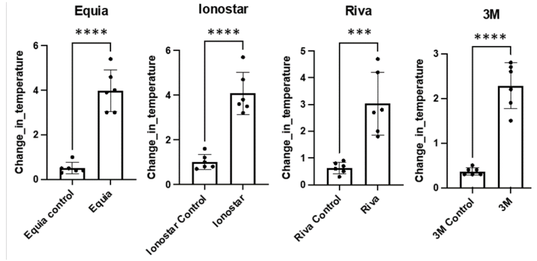

Figure 3: Intrapulpal temperature rise of different GICs following light cure compared with self curing according to manufacturer instructions. Student's t-test was used followed by Tukey's multiple-comparison test. Data are expressed as mean ± SD. * P<0.05, ** P<0.01, *** P<0.001, ****P<0.0001

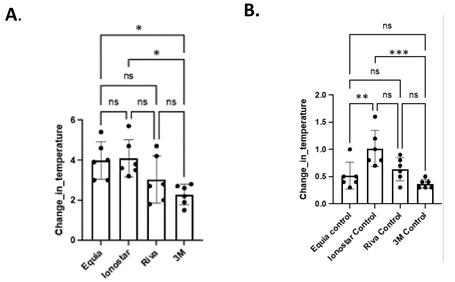

Figure 4: Comparison of intrapulpal temperature rise among different GICs. (A) Temperature rise of each GIC following light cure. (B) Temperature rise of each GIC during self cure according to manufacturer instructions. ANOVA followed by Tukey's multiple-comparison test was used.
Data are expressed as mean ± SD. * P<0.05, ** P<0.01, *** P<0.001, ****P<0.0001, ns=no statistical difference

Conclusion:

- All the tested GIC show less than 5˚C temperature increase following thermo-curing, with 3M showing the least temperature increase.
- Thermo-curing may be used for command setting of conventional GIC to accelerate clinic setting.

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