Recently, it was demonstrated that pre-heating a commercial composite prior to photo-activation significantly increases monomer conversion, possibly reducing the light exposure duration (Daronch et al., 2005). However, temperature increases associated with higher rates of conversion, which could result in elevated values of contraction stress.

This study investigated the influence of composite curing temperature and light-exposure duration on monomer conversion and contraction stress of a commercial micro-hybrid resin composite.

HYPOTHESES:
1. An elevation in composite temperature prior to curing increases monomer conversion and contraction stress values;
2. Pre-heated composite requires shorter exposure duration to achieve similar conversion values as those seen when using conventional exposures at room temperature, and, therefore, the contraction stress may be reduced.

RESULTS

<table>
<thead>
<tr>
<th>Temperature (°C) / exposure duration (s)</th>
<th>Monomer conversion (%)</th>
<th>Max. Contraction stress (MPa)</th>
<th>Final Contraction stress (MPa)</th>
<th>Relaxation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 / 5</td>
<td>39.1 (7.1)c</td>
<td>1.6 (0.2) D</td>
<td>1.6 (0.3) b</td>
<td>0.5</td>
</tr>
<tr>
<td>22 / 20 (control)</td>
<td>47.2 (1.9)b</td>
<td>5.2 (1.1) B</td>
<td>5.1 (1.1) a</td>
<td>0.0</td>
</tr>
<tr>
<td>60 / 5</td>
<td>59.4 (5.4)a</td>
<td>3.2 (0.7) C</td>
<td>2.7 (0.6) b*</td>
<td>15.5</td>
</tr>
<tr>
<td>60 / 20</td>
<td>64.7 (2.6)a</td>
<td>6.9 (0.6) A</td>
<td>5.2 (1.0) a**</td>
<td>25.4</td>
</tr>
</tbody>
</table>

Within a column, groups identified with similar letters are not statistically different, p > 0.05
* t-test between Max and Final stress: p = 0.005
** t-test between Max and Final stress: p < 0.01

MATERIALS AND METHODS

- Composite: Esthet-X (Caulk-Dentsply), shade A2
- Light-exposure durations: 5s or 20s (control)
- QTH conventional light-curing unit: Optilux 501(Kerr), 630 mW/cm²
- Composite pre-cure temperatures: 22° C (control) / 60° C (pre-cure)

CONCLUSIONS

Both hypotheses were accepted. Based on limitations imposed, the following conclusions may be drawn:

- For equivalent exposure durations, temperature increase produced higher monomer conversion and contraction stress values.
- Pre-heated composite allowed use of shorter exposure duration of 75%, producing higher conversion and lower contraction stress than control.