

The comparison of relative reliability on biaxial and three point strength methods of light curing composite resin

Deog-Gyu Seo*, Byoung-Duck Rho

Department of Conservative Dentistry, College of Dentistry, Yonsei University, Seoul, Korea

I. Objectives

The majority of studies comparing the mechanical properties of brittle dental restorative materials now include use of the Weibull Modulus (m). This modulus is determined from analysis of the statistical distribution of strength measurements, which can be determined using a variety of methods, including biaxial flexure, 3pt bend and 4pt bend. In comparing materials it is usually implicitly assumed that the modulus (m) is independent of test method although it is recognised to be highly dependent on flaw distributions. However, in some cases flaw distributions can be modified by sample preparation and test method may modify stressing patterns. This study investigated the pattern of strength and m in two light setting materials.

II. Material and Methods

Specimens ($n=20$) of Microfill[®] and Renew[®] (Bisco) composite were fabricated for bi-axial flexure and three-point flexure strength testing following 24 h immersion in a lightproof waterbath maintained at 37 °C. Poisson ratio: 0.24, Instron head speed: 0.75mm/min.

III. Results

Bi-axial strengths of Microfill[®] and Renew[®] were determined as, 113MPa ($m=7.8$) and 144MPa ($m=10.6$), respectively whilst the 3Pt flexure strengths were 89MPa ($m=5.5$) and 118MPa ($m=6.9$). The values for m from the 3pt bend data are significantly lower than that from the biaxial data and cannot be explained by anticipated differences in m produced by the different test methods.

IV. Conclusions

The higher consistency of the Bi-axial data can be attributed to the absence of the need for repeated light exposure, required in the generation of test bars, indicating that biaxial testing is a more reliable test method for light setting brittle restorative materials.