

Fatigue resistance of different glass fiber posts

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INTRODUCTION: Fatigue is considered as one of the main causes of structural failure in operative dentistry. Fatigue tests can reveal the resistance level of each type of post under cyclic loading that simulates the normal occlusal and masticatory functions [1]. The aim of this study is to evaluate the fatigue resistance of various fiber posts and to check the existence of a correlation between their resistance and their composition.

METHODS: The posts of the various brands are not all cylindrical and do not all have the same diameter. In order to compare the fiber posts amongst themselves, the manufacturers have designed perfectly cylindrical experimental posts 25 mm in length and 1.8 mm in diameter. The nature and the proportions of their various components are identical to those that are proposed to dentists. Five types of fiber posts were selected for this study. They were Group 1: Aestheti-Plus exp (RTD,Fr), Group 2: Light-Post exp (RTD,Fr), Group 3: Snowpost exp (Carbotech,Fr), Group 4: Snowlight exp (Carbotech,Fr) and Group 5: FRC Postec exp (Ivoclar-Vivadent, Liech).

Ten posts from each group were tested in a fatigue machine (Procyon Systèmes, Fr).

The three-point bending method of loading was applied with a loading angle of 90°. A cyclic force ranging from 25N to 100N was applied at a frequency of 3 Hz. The two supports and the central loading anvil had a diameter of 3 mm and the distance between the two supports was 9 mm. All the tests were carried out at room temperature. The device has a counter that measures the number of cycles and stops when the specimen breaks. The tests were stopped voluntarily after 2 million cycles, which would simulate about four years of physiologic occlusal and masticatory activity. After studying ANOVA validity conditions, we chose the Fisher's protected least difference (PLSD) parametric test to identify differences between pairs of groups.

RESULTS: Group 1 = 2.000.000a ± 0; Group 2 = 2.000.000a ± 0; Group 3 = 1.740.555a ± 436.140; Group 4 = 612.631b ± 503.538; Group 5 = 2.000.000a ± 0. Means with the same letter

indicate non-significant differences (p>0.05). Snowlight exp showed fatigue resistance that was significantly lower than that of any other post tested (p<0.0001). 100% of Snowlight exp and 30% of Snowpost exp were fractured during the test.

DISCUSSION & CONCLUSIONS: As compared to the resin matrix, fibers form the stiffer component in a post and a higher fiber density should lead to greater fatigue resistance [2]. Nevertheless Snowlight exp is composed of the highest percentage of fiber (64%) embedded in a polyester methacrylate matrix, which differentiates these posts from the others that contain less fiber and are composed of epoxy resin or UDMA. The percentage of fibers does not seem to be a factor determining the fatigue resistance. The methods of fabrication, the modulus of elasticity of the resin matrix, how the fibers are silanized prior to embedding in the matrix, and/or voids present within the resin or in the discontinuities along the interfaces between fibers and matrix can provide an explanation for the differences in resistance to fracture of the posts under cyclic load [3].

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