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Choosing Biomaterials for Bruxism Patients: in Vitro Pilot Study

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Objectives This study is meant to provide data for selecting the right biomaterials for a clinical study of the survival of fixed dental-supported prosthesis in bruxism patients. The objective is to compare the biaxial flexural strength of diverse CAD/CAM biomaterials, before and after a mechanical fatigue, similar to bruxism.

Methods A composite CAD/CAM bloc Cerasmart 270 (C270), a polymer-infiltrated composite network bloc Enamic (ENA) and a lithium disilicate ceramic bloc (EMX) were studied. 12x0.2mm discs of each material were prepared. The samples have been soaked in water for 10 days prior to testing. The biaxial flexural strength (piston on 3 balls, P3B) was measured (n=3). A fatigue test simulating 457 day of bruxism, using variable loads between 20N and 130N, at 37°C and 95% humidity was performed (n=3). The main outcome was the survival of the sample - absence of fracture. After the fatigue test, the surviving samples were studied under optical microscope looking for cracks and fissures. A post-fatigue biaxial flexure test was also performed. The results were analysed with a non-parametric Kruskal-Wallis test, then a Dunn test, $p = 0.05$. The survival test was analysed with a Log-Rank test.

Results The biaxial flexural strength (MPa) of the biomaterials prior to any fatigue was: ENA 152.64 ± 5.64 , C270 $288,80 \pm 4,55$ and EMX $468,14 \pm 13,82$. Only in EMX and C270 groups, all samples have survived the bruxism simulation. A loss of up to 27% (77MPa, C270) of the biaxial flexure resistance was registered after fatigue.

Conclusions The studied biomaterials have a different resistance to fatigue simulating bruxism. C270 can be proposed for a clinical study on the survival of fixed prosthesis in bruxism patients, where it should be compared to the disilicate vitro-ceramic, EMX.