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BASIC RESEARCH

Flexural strength of the various materials fabricated with 3D printing for implant 3unit bridges

Kim Seong Kyun, Park Gangseok Park
Lee Joo-Hee, Heo Seong Joo, Koak Jai Young

Abstract

Manufacturing with digital additive manufacture technique has many advantages. But, due to insufficient studies in the area, it is not being widely used in the dental clinics.

In this study, the differences of flexural strength among various resin materials fabricated with a digital 3D printing for 3-unit implant bridges were analyzed.

High flexural strength was shown in 3-unit bridges that were 3D printed digitally using the DLP machine with the monomer-based methacrylic ester material.

Methods and Materials

Metal jigs for the specimens that had a 3-unit bridge figure were fabricated. Three different kinds of materials of specimens which were CV, SM, and DLP were fabricated of five specimens for each kind of material. DLP was printed with an angle of 30° from the horizontal surface. The specimens were placed on the jigs and the flexural strength was measured and recorded. The recorded data was analyzed in SPSS using One-way ANOVA and Tukey SHD to determine the significance of the differences of flexural strength among the groups of specimens.

Fig. 2. Procedure of specimen fabrication. (A) Metal jig with IP-scan-spray, (B) Metal jig in the scanner, (C) Scanning area setting, (D) Virtual model of metal jig, (E) Setting cement gap, (F, G) Bridge design, (H) Specimen designed with supporters.

Results

The flexural strengths of each group were the followings; CV: 565 ± 180 N, SM: 1218 ± 59 N, DLP: 1189 ± 174 N. Using One-way ANOVA and Tukey SHD, CV had significantly lower flexural strength than the other groups ($P<0.05$), but there was no significant difference between DLP and SM ($P>0.05$).

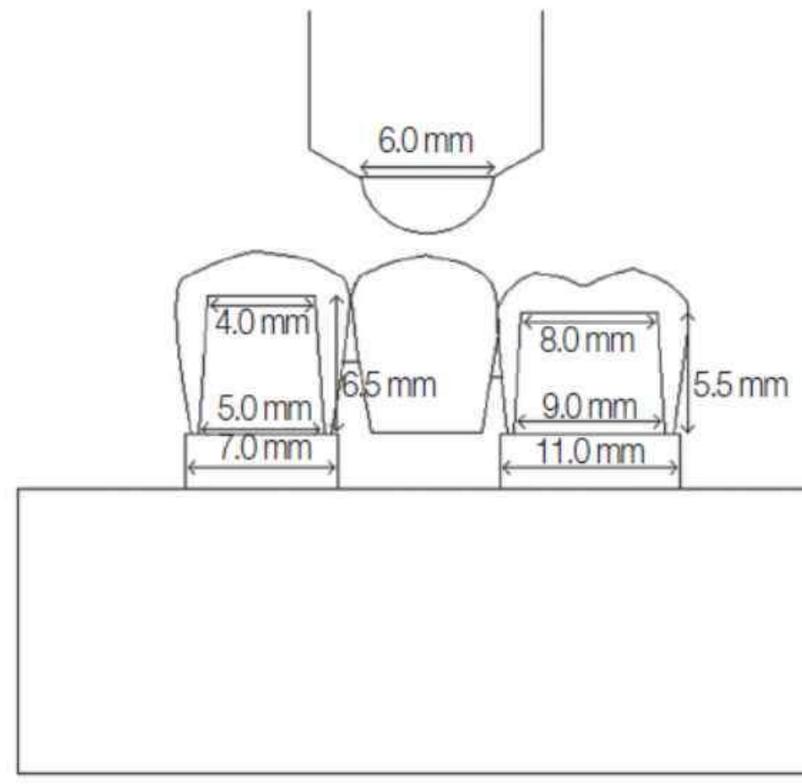

Fig. 1. Dimension of metal jig and specimen, indenter.

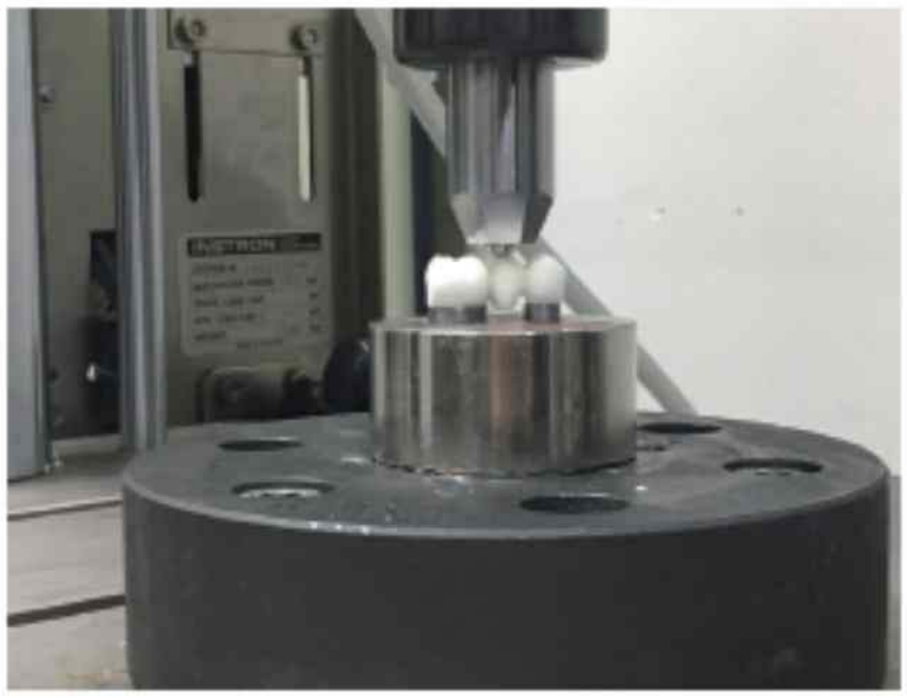

Fig. 3. Flexural strength test of specimen with Universal testing machine.

Presented at
EAO CONGRESS
EUROPEAN ASSOCIATION FOR OSSEOINTEGRATION
Vienna
2018