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Influence of the Heat Treatment on SLM-Manufactured Clasps' Deformation

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Objectives Many studies have assessed the effect of the printing angle of the RPD framework on the deformation or other mechanical properties using selective laser melting technique. Only few studies focus on the influence on the clasp. Even if the framework is printed at the optimal angle, each clasp at different positions of the framework may not necessarily follow the optimal angle. The purpose of this study is to reduce the deformation defects caused by the printing angle via designing supporting structures.

Methods The rest seat and guide plane were prepared on a model tooth. The model was scanned and the clasp was digitally designed. To allow accurately measuring the deformation, a flat plate was added to the proximal plate. The clasp was manufactured with three printing angles (90 degrees ,45 degrees, -45 degrees) and four types of supporting structures (none, automatic generation, manually added, block generation). For the group of manually added, supporting structure was added to the area with stress concentration based on the result of the clasp-removal simulation. All clasps were scanned before and after removing the support structure to evaluate deformation caused by removing the supporting structure.

Results When containing angles between the supporting structure and the clasp arms was closer to 90 degrees, the deformation was smaller. As the number of supporting structures increased, deformation became smaller, but surface roughness was increased. The amount of deformation in the group of manually added and block generation were similar. When the printing angle was -45 degrees, removing supporting structures resulted in less deformations.

Conclusions When the printing angle was 90 degrees with manually added supporting structures, clasp has less deformation and better surface roughness.