



INTRODUCTION

Stainless steel crowns (SSCs) are commonly used to repair primary and permanent molars, but their long-term success is often limited by crown loss due to cementation failure.¹⁻³ To achieve successful SSC placement, close adaptation of the crown margin to the tooth surface and suitable luting cement are essential.¹⁻³ However, there has been a lack of research on the effects of silver diamine fluoride (SDF) on SSC retention, despite its popularity in minimally invasive caries management.⁴⁻¹⁰ The Hall technique, which involves placing an appropriately sized stainless-steel crown on a decayed primary tooth without anesthesia or tooth preparation, has become increasingly popular for high caries-risk patients.⁴⁻¹⁴ The aim of this study is to investigate whether prior application of SDF affects SSC retention rates. If SDF enhances the bond strength of glass ionomer cement, it may be encouraged before Hall Crown placement. The results of this study could inform clinicians on the use of SDF in minimally invasive SSC restoration, which could benefit patients with cavitated lesions, behavioral or medical challenges, and those at high risk for caries.

OBJECTIVE

The objective of this study was to determine whether SDF applied to extracted primary molars affects the retention strength of HCs

METHODS

IRB status of exempt (IBC #22038) was granted for this study by the Louisiana State University Health Science Center, New Orleans, Louisiana, USA on March 3, 2022. Thirty eight primary molars that were free from developmental defects and with minimal occlusal caries were collected over six months from patients at the LSUHSC School of Dentistry. Informed consent was obtained from all patients undergoing dental surgery procedures including consent for the collection of specimens. Collected teeth were stored in a sodium thymol solution.¹⁵ White polyethylene terephthalate glycol square molds were designed, and 3D printed as the collected teeth were embed in a clear Jet acrylic monomer and polymer mixture. The teeth were then scanned using DOF UHD Lab Scanner, the surface area of each tooth was measured, and the measurements were recorded in Microsoft Excel. Teeth were then randomly assigned to the experimental or control group using a randomization table. For both groups, a 1 mm hole was drilled in the center of the selected SSCs using a carbide bur, and a nail was placed through the hole and soldered together to create a loop to facilitate attachment to the universal testing machine.¹⁶⁻¹⁹ SDF was then applied to the experimental teeth according to established application guidelines, and both groups received a modified SSC via the Hall Crown technique.²⁰ Rely-X luting cement was used per the manufacturer's instructions. The mean and standard deviation of maximum load at break and tensile stress were measured, and the measurements were recorded in Microsoft Excel. Statistical analysis was performed via Wilcoxon Signal Ranked Test along side least squares regression and permutation tests.

RESULTS

Average Maximum Load, Tensile Strength and Area by Group

Group	Maximum Load Mean±SD*	Tensile Strength Mean±SD†	Area Mean±SD‡
Control	104.567±63.388	0.676±.428	160.964±36.909
Experimental	111.993±69.075	0.722±0.429	154.319±29.889

*Maximum load was measured in Newtons
†Tensile Strength was measured in Megapascals
‡Area was measured in mm²

Table 1. Average Maximum Load, Tensile Strength and Area by Experimental Group

Tensile Stress at Break by Group

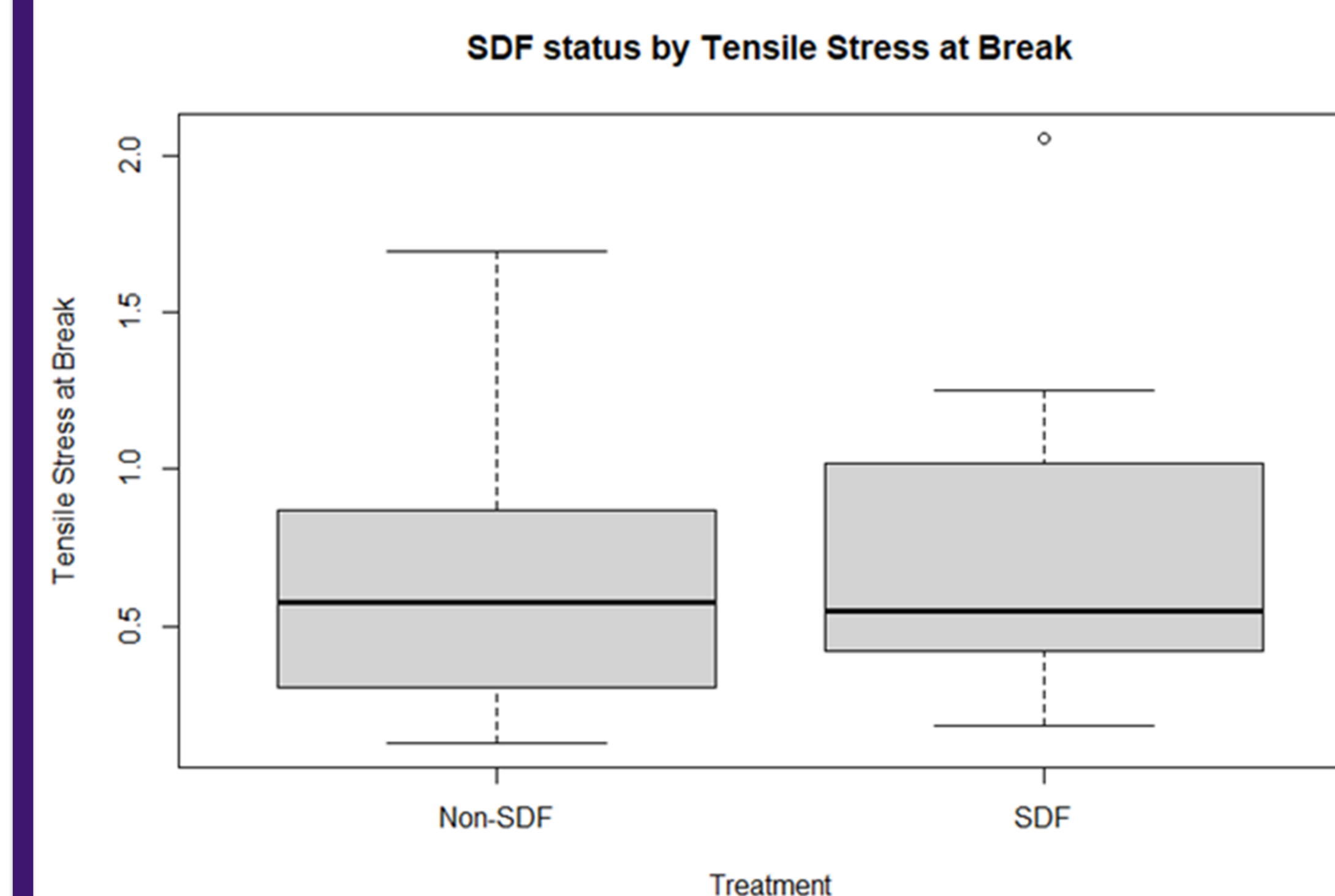


Figure 1. Tensile Stress at Break by Group

Maximum Load at Break by Group

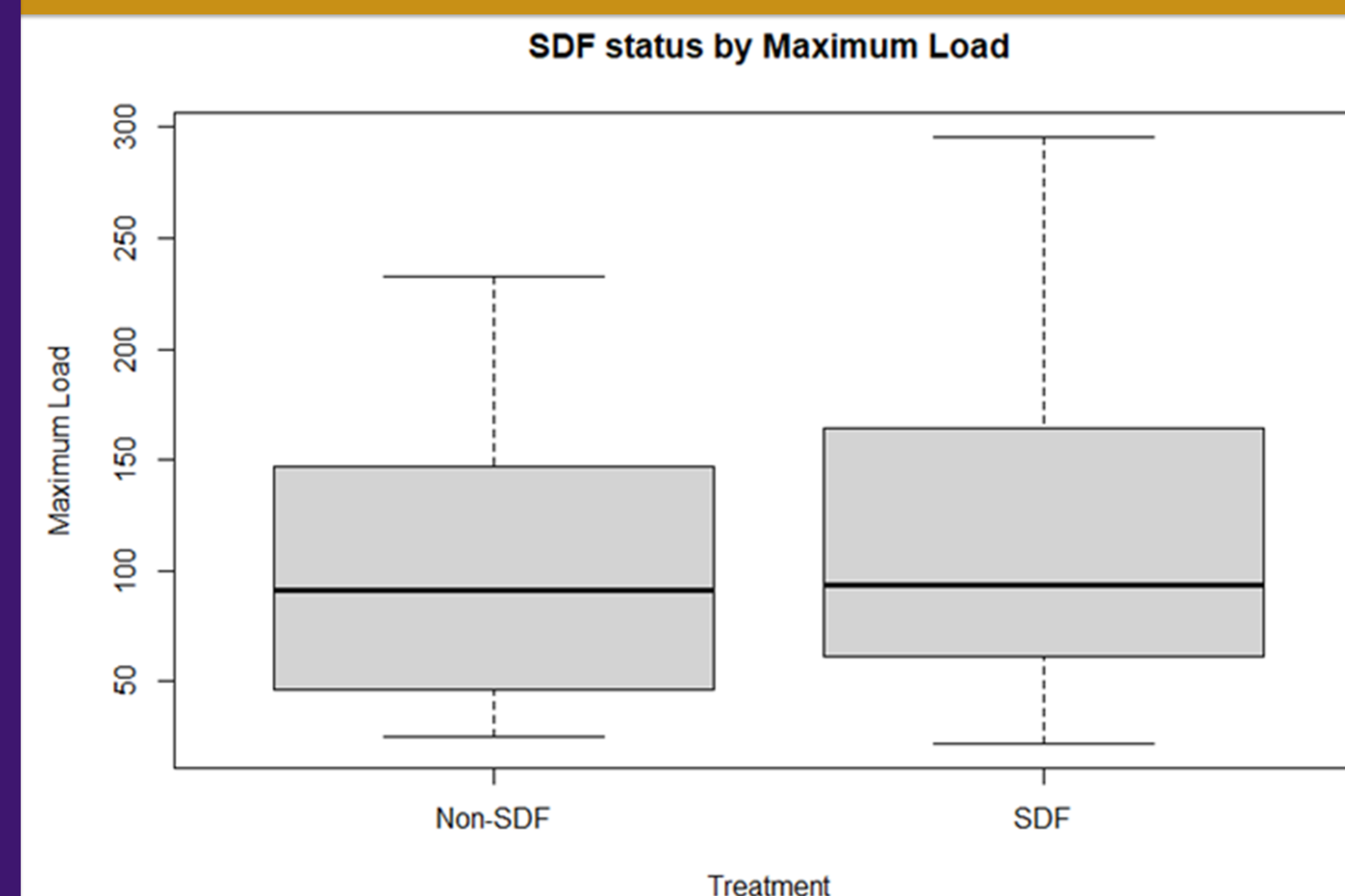
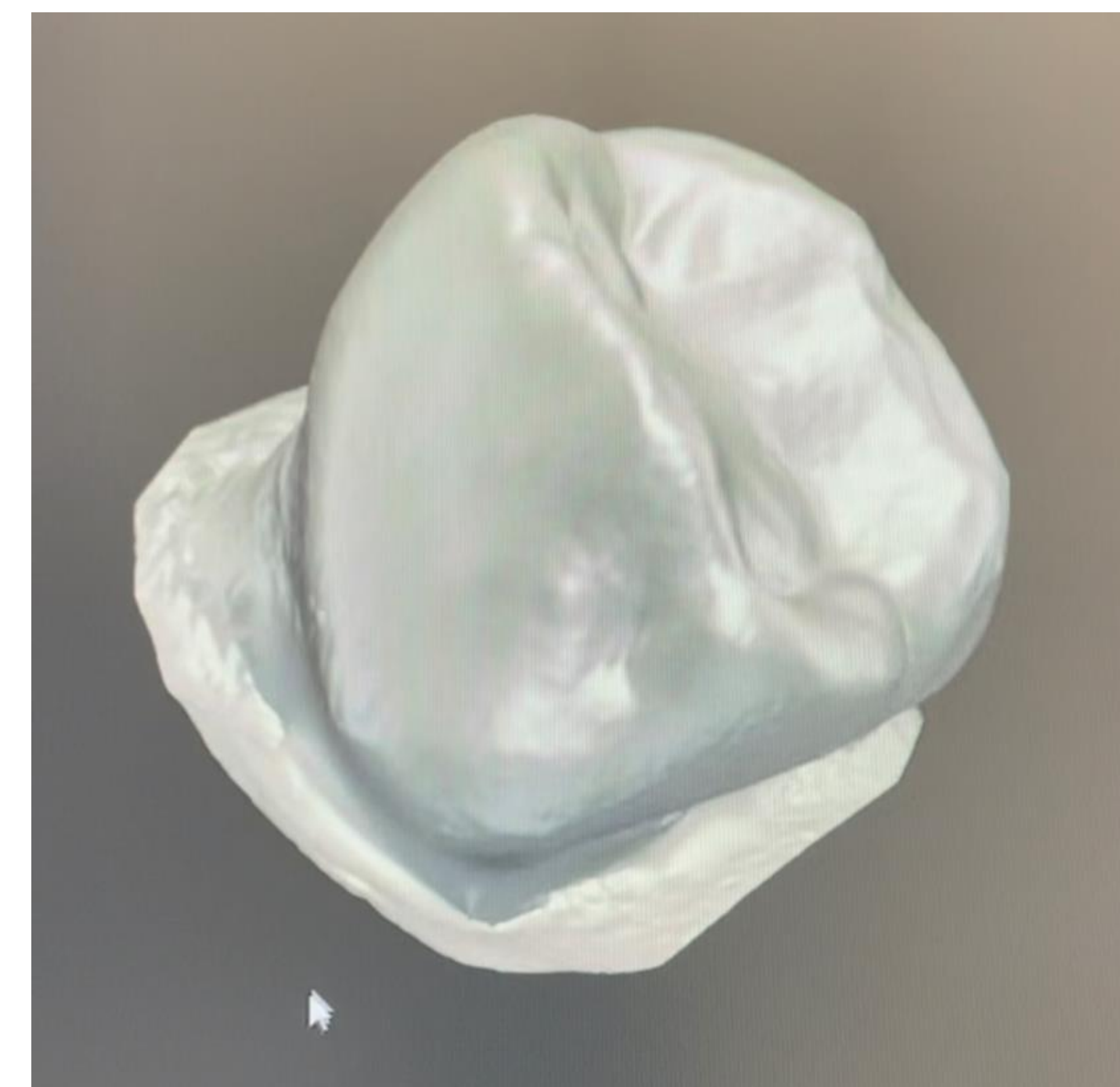


Figure 2. Maximum Load at Break by Group

Photo of Created STL



Representative photographic picture showing an example of an STL created following scanning in the DOF Scanner.

Photo of Testing Mechanism



Representative photographic picture showing the testing of retention strength with the Instron 5566.

CONCLUSIONS

- SDF application prior to Hall Crown placement did not significantly reduce SSC retention strength.
- From a retention strength standpoint, prior SDF application does not serve as a contraindication for Hall Crowns.

ACKNOWLEDGEMENTS

Special thanks to Drs. Wen, Xu, Chapple and Johnson for their assistance in organizing and conducting this experiment.

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