

Objectives

CAD-CAM has revolutionized the digital workflow, but what about the critical level of creating cement space? Past studies have evaluated the effect of CAD-CAM generated cement space on the marginal fit of milled crowns or the ability of CAD-CAM to consistently reproduce die space prescriptions. No studies have reported on the algorithm followed by 3rd party dental laboratories using CAD-CAM technology to generate cement space. Furthermore, there is limited research on the variation of die space prescribed when the tooth preparation is ideal versus less ideal, as well as if the preparation had modifications, such as auxiliary grooves.

A case report will highlight a single unit #19 preparation with 2 auxiliary grooves and the CAD-CAM/conventional die space protocol utilized for crown fabrication.

Case History

84-year-old male presents to Stony Brook Prosthodontics with heavily restored dentition and significant bruxism. Pt presented with CC "I chipped my back tooth and I have pain in that area to cold."

Clinically, #19 had a DL and DB cusp fracture, a buccal non carious cavitated lesion and significant occlusal wear. Decision was made based on comprised #19 for an all-coverage restoration. Pt was not esthetically driven; therefore, full cast gold crown was selected. Due to provisional dislodgement, 2 auxiliary grooves were prepared.

Technical Steps and Outcomes

- 1) Shoulder margin prepared and scanned using Trios 3 Shape.
- 2) Laboratory printed a resin model with removable die without die space prefabricated.
- 3) Conventional casting protocol followed. Die spaced applied manually. 1 coat of die spacer (15 microns) on axial and occlusal. 1 coat of die placed on mesial auxiliary groove (mistake by lab).
- 4) Significant intaglio chairside adjustments made; crown cemented with RMGI.



Figure 2. Provisional #19 with M and L auxiliary groove

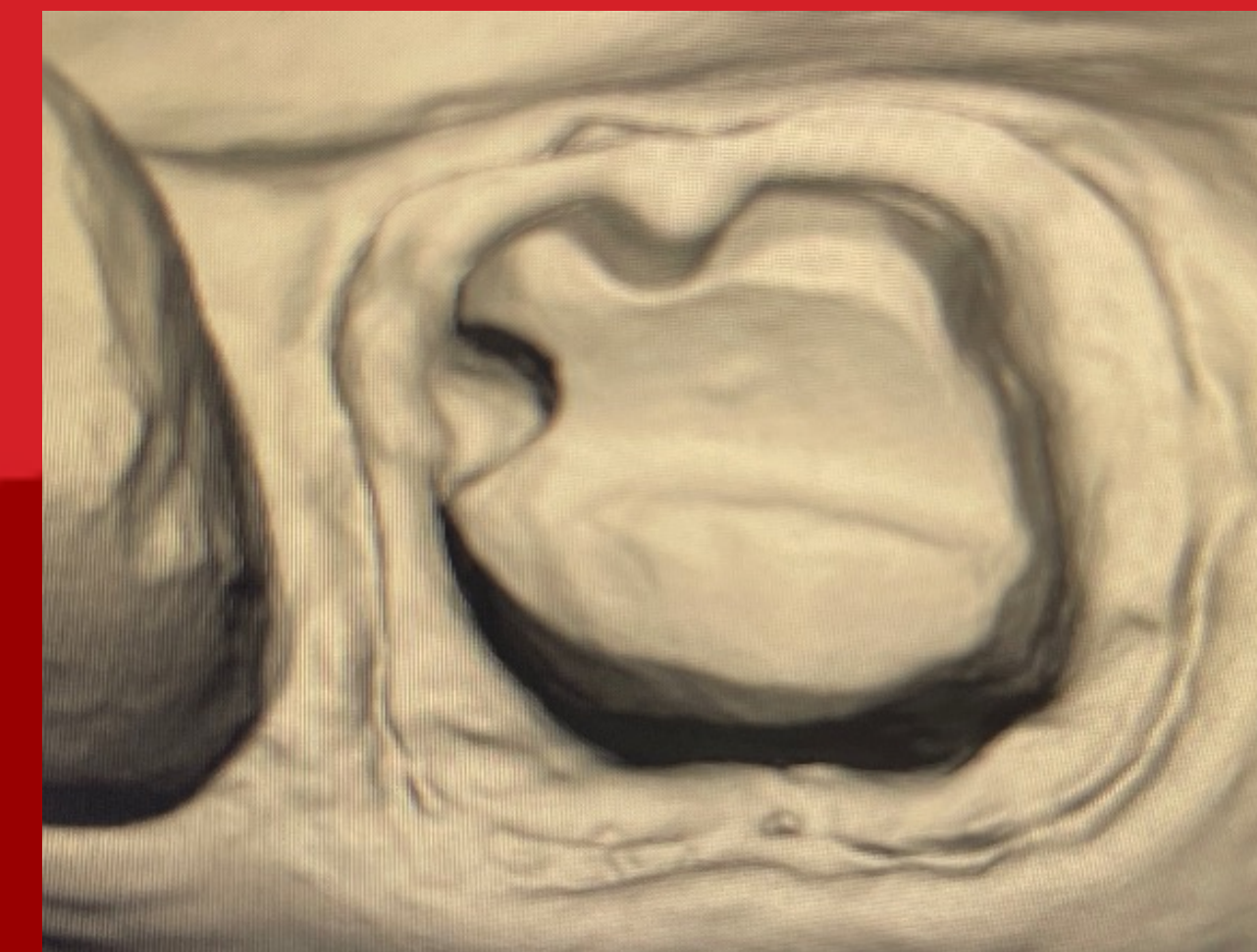


Figure 1. Digital impression #19

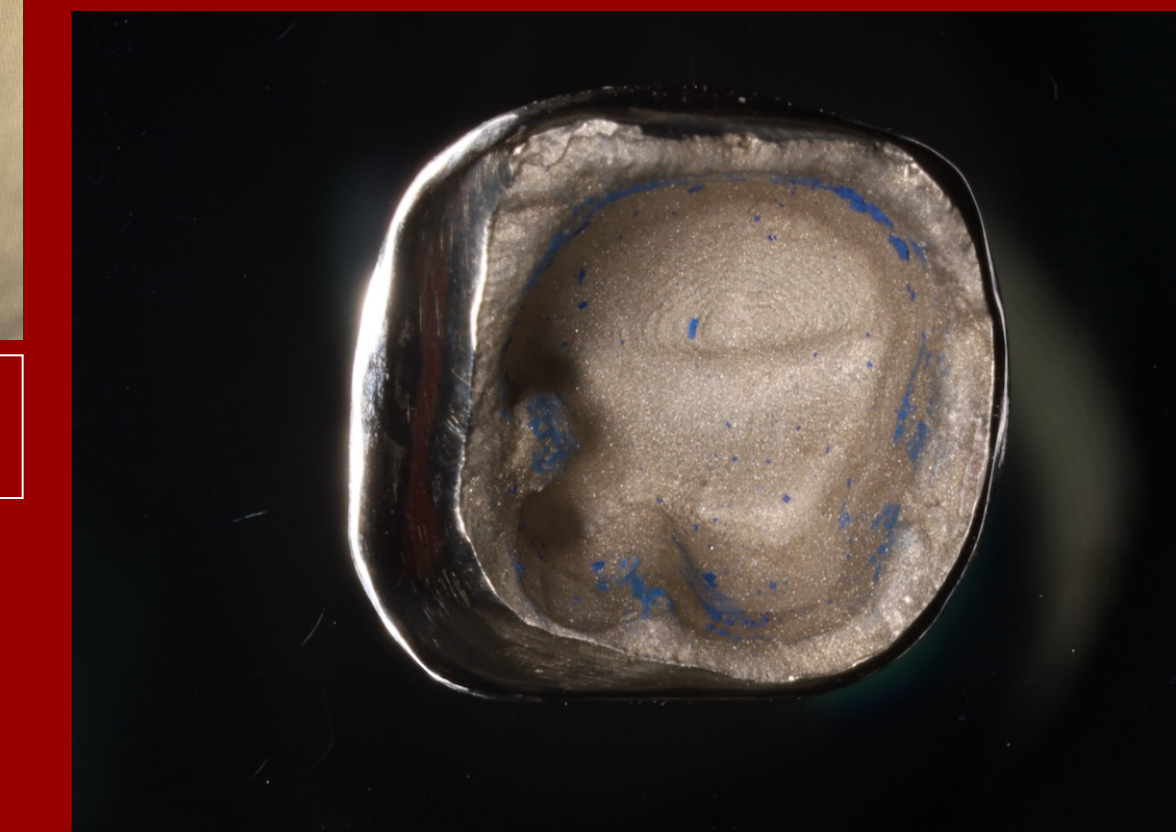


Figure 3. Full cast #19 with M and L auxiliary groove



Figure 4. Fit checker adjustments sequentially left to right for #19 full cast crown prior to cementation

Discussion and Conclusion

Precise fabrication of die space is critical for:

- Increased retention
- Improved marginal fit
- Increased fracture strength

CAD-CAM workflows demonstrate the potential to control die space, but studies have outlined the inconsistencies of CAD-CAM printing precise restorations with the correct internal gaping (cement space).

Future study will be performed as a concept discussion that will elucidate the protocols followed by a specific laboratory on creating die space for milled restorations and what modifications are made depending on changes in prep design, and if this is presently modified by existing proprietary AI.

References

- Olivera AB, Saito T. The effect of die spacer on retention and fitting of complete cast crowns. *The Journal of prosthetic dentistry* (2006)15: 243-249
- Hoang, Lisa N., et al. "Die spacer thickness reproduction for central incisor crown fabrication with combined computer-aided design and 3D printing technology: an in vitro study." *The Journal of prosthetic dentistry* 113.5 (2015): 398-404.
- Campagni, W. V., William Wright, and James T. Martinoff. "Effect of die spacer on the seating of complete cast gold crowns with grooves." *The Journal of Prosthetic Dentistry* 55.3 (1986): 324-328.
- Goodacre, Charles J., Wayne V. Campagni, and Steven A. Aquilino. "Tooth preparations for complete crowns: an art form based on scientific principles." *The Journal of prosthetic dentistry* 85.4 (2001): 363-376.