Lithium Disilicate Crowns
Preparation Guidelines To Ensure Effective Outcomes

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At the Integra Institute we understand the serious challenges our clients are facing in regards to their choice in crown selection and the pursuit of excellence. We want to help you navigate these difficult choices by educating you with the most contemporary research. The information contained in this report is designed to give you a working knowledge of crown preparation for esthetic restorations. Lithium disilicate restorations possess characteristics that are unique unto themselves that other esthetic restorations do not possess.

This Report Focuses On Optimizing Strength of Lithium Disilicate Crowns For The Occlusal Table.

The recent advances in dental ceramic materials gives the dentist many different restorations to choose from when designing a treatment plan. Fortunately, because of esthetic and functional requirements and strength considerations of brittle dental materials, what was discovered in the late 1980’s with regard to preparation design for maximum strength of all porcelain crowns remains in effect today. Whatever your restorative material for crowns may be, your preparation technique should remain constant.

Armamentarium

The preparation armamentarium is standard whether you are prepping a crown on a molar, or a veneer on a central incisor. With the advent of adhesive technology the rules of tooth preparation have changed. It is no longer necessary to specifically utilize the principles of G.V. Black. Macro-mechanical retention is still a consideration. Creating a sound base for your dental ceramic material is most important. You must remember that for every restoration placed in the mouth the material should be of sufficient thickness to withstand the forces placed upon it on it ‘s own, or it is destined to fail. Recently, esthetic dental restoratives porcelain materials have been created that allow standard forms of cementation. There are indications for conventional types of cementation which are not the scope of this report. However, you must determine how the restoration will be cemented prior to preparation. Macro mechanical considerations must be made during preparation to determine how much retention is necessary to ensure a positive outcome with conventional cementation.
Posterior Crown Preparation Bur Armamentarium

Each bur has a specific purpose in the armamentarium and will be addressed during preparation and methods. The following burs are used for preparation.

A. 331 Carbide Bur
B. Coarse Football diamond
C. Cylindrical Chamfer Diamond, #847-016
D. TPE (Tissue Protecting End Cutting) Diamonds 1.2 mm width
E. Cylindrical White Arkansas Stones

Preparation Mechanics

The first preparation incision should be made in the central groove for two reasons: First, it will be deepest part of the occlusal surface of the preparation. Secondly, by marking this groove in the preparation, it allows the ceramist to know where the groove should be placed in the restoration. The central groove can also orient the ceramist to proper cusp placement. Incisions are made in the central groove with a 331 carbide bur. The head of the 331 carbide bur measures 2 mm. The bur should be buried to the entire depth of its head (2 mm) for the entire length of the groove. Similar 2 mm incisions can be made in the buccal and lingual occlusal grooves. The highest points of the occlusal table are the cuspal incline planes, not the cusp tips. Place incisions to the depth of a 331 bur on each inclined plane. The bur should be placed perpendicular to the surface of the cuspal incline. The bur should not be perpendicular to the long axis of the tooth. This is the only way to insure a 2 mm reduction in these areas. When posterior crowns need occlusal adjustment in the mouth, these are the primary areas of adjustment because tooth structure was removed in the wrong plane. The result is too much tooth structure is removed at the cusp tip and not enough on the cuspal incline.
Place three incisions, approximately 1.5 mm deep, with a 331 bur on the buccal surface. Place three incisions, approximately 1.5 mm deep on the lingual surface with a 331 bur. The occlusal table depth grooves can be connected and the occlusal table reduced with the coarse football diamond. Above the gingival crest, the buccal and lingual surface incisions are connected with a Coarse Football diamond bur. Interproximally use the 016 Coarse Cylindrical Diamond with a chamfered tip to reduce the marginal ridge area. Roughly prepare the buccal and lingual margin with the 016 coarse cylindrical diamond. The interproximal margin width on bicuspid teeth should be at least 1 mm. Any less reduction and the restoration will be prone to fracture in a mesio-distal direction. Use the coarse cylindrical diamond to shape the preparation walls and establish the depths for a shouldered margin. Final margins should be placed at the gingival crest buccally and 0.5 mm above the gingival crest lingually. Prepare and polish shoulder margins with a 1.2 mm TPE Diamond buccally, lingually, and interproximally. Polish the body of the preparation with an Arkansas Stone to eliminate coarse scars from the diamond. Smooth, round and polish the preparation.

Pay attention to the central groove in mandibular bicuspids. In many cases, the lingual is almost non-existent. The central groove will have a linguo-buccal component to it.

Crown Preparation Summary

- Occlusal reduction 2 mm with 331 carbide bur
- Shouldered margin, 1.2 mm buccal and lingual
- Shouldered margin no less than 1.2 mm interproximally (no less than 1 mm on bicuspid)
- Margin is at the gingival crest buccally
- Margin is 0.5 mm above the gingival crest lingually
- Preparation should be polished with TPE Burs and Arkansas White Stones.
Commonly Asked Questions of Preparation Techniques

1. What if there is severe recession on a molar? Do you extend your preparation to the gingival crest?

A 1.2 mm shoulder on molar roots without the risk of pulp exposure. Cover root structure if the patient has hypersensitive roots and wants them covered. Advise the patient before preparation of possible consequences of root preparation. It may compromise your result in some cases. Sometimes it may be advantageous to utilize PFM technology. If so, advise the patient of the possible unaesthetic consequences, i.e., black line margin. If the patient does not have severe root sensitivity, end your preparation at the CEJ. It is the only place where margins may be blended with the color changes horizontally.

Fig.1. Pre-Op Condition  Fig.2. 331 Bur 2 mm Head  Fig.3. Occlusal & Cuspal Depth Cuts

Fig.4. 2 mm Occlusal Reduction and Buccal-Lingual Depth Cuts  Fig.5. Finished and Polished
Fig.6. Post Op Lithium Disilicate Crowns

Fig.7. Prep Armamentarium. Left to Right: 016 Coarse Cylindrical Chamfered Diamond, 1158 Carbide, 1.2 TPE (Tissue Protecting End Cutting) Diamond, White Arkansas Stone. The 1158 carbide has been replaced by the Coarse Football Diamond.

Fig.8. Initial Depth Sound

Fig.9. 2 mm Depth Cut Through Central Groove

Fig.10. 2 mm Depth Cut Through Cuspal Inclines

Fig.11. Occlusal Reduction
Fig. 12. Buccal and Lingual Reduction

Fig. 13. Interproximal Reduction and Overall Margin Outline.

Fig. 14. Rough Outline Complete

Fig. 15. 1.2 mm Shouldered Margin Creation With The TPE Diamond.

Fig. 16. Polish Preparation With The Arkansas Stone.
In Summary

In vitro compression studies are an indication of in vivo performance of lithium disilicate crowns. Careful attention to posterior crown preparation can increase the strength of lithium disilicate crowns. Results of a laboratory compression study suggests there is a correlation between lithium disilicate strength and preparation design. Allowing for a minimum occlusal clearance of 1.5 mm the lithium disilicate crown will perform more than admirably with testing strengths that were 20% stronger than a natural tooth in cusp-to-fossa physiology compression. Placing depth cuts when beginning a crown prep will ensure enough occlusal clearance to ensure a beautiful and long lasting result.

The 331 carbide bur, an inverted pear shaped carbide bur, can be used as a depth cutting bur because it's head measures 2 mm. A standardized bur armamentarium of coarse cutting diamonds, margin polishers, and body polishers will ensure a predictable long lasting excellent result.

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Other areas of emphasis:
• Lithium Disilicate framework designs for anterior teeth.
• Value differential of central, lateral, and canine
• Color Logic decoding of a natural tooth
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