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Clinical Technique/Case Report

The Tucker Technique: The Proximal Hollow Grind to Address a Root Concavity

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Clinical Relevance

This case report describes a modification of the Tucker technique to manage a concavity of a proximal surface when a traditional cast gold box form would be too invasive. A conservative and esthetic alternative to this box form is the proximal hollow grind.

SUMMARY

Cast gold inlays have long been used to conservatively restore compromised tooth structure. When the mesial or distal proximal surfaces are indicated for restoration and a cast gold restoration is desired, traditionally a box is prepared with an external bevel. Often a root concavity does not allow for a standard box form or the external and/or internal bevels. A proximal hollow grind can be utilized to address limits of standard inlay or onlay preparation design.

INDICATIONS

Cast gold inlays have long been used to conservatively restore compromised tooth structure. When the mesial or distal proximal surfaces are indicated for restoration and a cast gold restoration is desired, traditionally a box is prepared with an external bevel.[1] With a single proximal box on a bicuspid or maxillary first molar where the oblique ridge is not broken, often an internal bevel is placed in the dentin to create a guiding plane for accurate seating of the casting.[2] The internal bevel ensures a tight gingival seal upon cementation. Often a root concavity does not allow for a standard box form or the external and/or internal bevels. A proximal hollow grind can be utilized to address limits of standard inlay or onlay preparation design.[3]

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TECHNIQUE

Teeth 4 and 5 were observed to have mesial and distal decay secondary to excessive consumption of highly acidic energy beverages. Tooth 4 was restored with a MOD amalgam, and a composite buildup was placed in tooth 5 for a future inlay restoration. Twelve months later, the patient returned with a fractured tooth 4–MOD amalgam despite what appeared to be sufficient occlusal depth of the preparation (Figures 1 and 2). The patient elected to have teeth 4 and 5 restored with MOD cast gold inlay restorations to resist failure due to fracture.[4,5]

The occlusion was evaluated and anesthesia administered. A rubber dam retainer (Hu-Friedy,

Figure 1. *Preoperative condition.*

Figure 2. *Bitewing radiograph illustrating thickness of tooth 4 amalgam.*

Chicago, IL, USA) was applied to tooth 3, and holes with approximately 3.5 mm of space between each were punched in the heavy-weight rubber dam (Hygenic Dental Dam Latex; Coltène/Whaledent, Cuyahoga Falls, OH, USA). The rubber dam was placed for optimal isolation and access by extending from tooth 3 to tooth 11. Typically all of the existing restorative material and any caries would be removed. However, in this case the operator elected to utilize the existing composite buildup on tooth 5. The fractured amalgam was removed from tooth 4 with a #6 high-speed round bur (Midwest/Dentsply International, York, PA, USA). A band and retainer (Tofflemire; Water Pik Inc, Fort Collins, CO, USA) without gingival wedging was applied to tooth 4, and dual-cure composite (ParaCore; Coltène/Whaledent) with its associated adhesive was used to build up to close-to-original contours.

An essential concept of the Tucker technique is the use of a buildup. The buildup allows conservative cavity preparation because the operator does not need to extend occlusal and axial walls to address undermining caries or extensions of previous restorations. Ideal taper, smoothness, and proportions can be created.

Initial occlusal preparation of both tooth 4 and 5 was performed using a #56 fissure carbide bur (Midwest/Dentsply International). The mesiobuccal line angle of tooth 4 was used as a guide for preparation to minimize the buccal extension and the display of gold to maintain esthetics. On both tooth 4 and 5, depth of the central groove area was reduced to approximately 1.5 mm and that of the buccal and lingual walls 2.5 mm as a result of the inclines of the cusps. The #56 carbide was used to create an angulation of approximately 3°-5° on each of the occlusal walls, and therefore an ideal preparation taper of 6°-10° was produced.

The mesial of tooth 5 was initially prepared using the #56 bur. Once the mesial concavity was visualized the decision to prepare a mesial hollow grind was made. A relatively simple preparation with rounded internal angles was made with a #7404 bur (Brasseler USA, Savannah, GA, USA).[3] Retention of the casting was maximized by keeping the #7404 bur at a consistent perpendicular angle to the pulpal wall as the bur was carried interproximally. Because of the diameter of the #7404 bur, the buccal and lingual extensions were finalized with a #7901 flame finishing bur (Midwest/Dentsply International). The #7901 bur is used to avoid contact with the adjacent tooth. Care was taken to create enough axial depth in the buccal and lingual extensions for bulk of gold during casting and accuracy of fit when seating and finishing. The #7901 bur was held perpendicular to the pulpal floor and was used in the painting stroke from the mesiobucco-gingival point angle and in blending occlusally to the bucco-occlusal line angle with a minimal lean toward the buccal. The #7901 bur was then used to finish from the mesiolinguo-gingival point angle to the linguo-occlusal line angle with slightly more angulation toward the lingual than was used toward the buccal. Ideal draw was achieved without unesthetic extension to the mesial buccal of tooth 5.

The mesial proximal draw of tooth 5 guided the preparation of its distal box. The #56 bur was used to establish a proximal box to a depth of 1.5 mm gingival to the pulpal floor, or 4 mm from the proximal-occlusal cavosurface on the mesial and distal of tooth 4 and distal of tooth 5. The mesiobuccal extension of

tooth 4 was kept conservative by planning the draw of tooth 4, including axial and proximal walls, to allow seating of tooth 4 before tooth 5.

The proximals, excluding the mesial of tooth 5, were trued using hand instrumentation. The 42S off angle chisel (G Hartzell & Son, Concord, CA, USA) was utilized to smooth the pulpal and gingival walls. Mesial proximal axial line angles are placed with the 42S off angle chisel, and distal proximal axial line angles are placed with the 43S off angle chisel (G Hartzell & Son). The mesial axial wall was smoothed with the 43S off angle chisel and the distal axial line angle with the 42S off angle chisel. External bevels (0.5 mm) were placed using a beveled cylinder carbide bur (H248-009; Axis, Coppell, TX, USA) and planed with the #233 Tucker gingival margin trimmer (G Hartzell & Son) on the mesial and the #232 Tucker gingival margin trimmer on the distal (Figure 3). The Tucker gingival margin trimmers have an angulation of 30° rather than the 45° angulation of non-Tucker gingival margin trimmers (G Hartzell & Son). Forty-five–degree gingival margin trimmers are used to place the internal bevel on restorations with a single proximal box. Internal bevels will increase retention and resistance form.

A small gingival retraction cord (#0 Ultrapak; Ultradent Products Inc, South Jordan, UT, USA) soaked in 25% aluminum chloride solution (Hemodent: Premier, Plymouth Meeting, PA, USA) was tucked into the sulci of teeth 4 and 5. Next a braided cord (#2 Gingi-Pak; Belport Co Inc, Camarillo, CA, USA) was placed into the sulci above the smaller cord for five minutes prior to being removed. Upon removal the preparations were impressed using only light-body polyvinyl siloxane (Flexitime; Heraeus, South Bend, IN, USA) syringed around the preparations and into a double arch tray (Check Bite; GC America, Alsip, IL, USA). Upon setting the impression was removed and inspected and judged to have sufficient detail. It was noted that the impression material capturing the mesial concavity of tooth 5 obscured the gingival margin when viewed directly from above (Figure 4).

Provisionalization was achieved with a piece of temporary stopping (Hygenic Temporary Dental Stopping; Coltene/Whaledent) heated with a lighter and placed with a Woodson 2 composite instrument (Hu-Friedy) into the proximals so that the acrylic (DuraSeal; Reliance Dental Mfg Co, Worth, IL, USA) would not contact soft tissue. Care was taken not to aggressively pack the stopping and create separation of the teeth. The temporary stopping was kept below the contact so that the acrylic would lock in. Acrylic was added using a liquid/powder technique and a disposable brush (Benda Brush; Centrix, Shelton, CT, USA). While the acrylic was soft the patient was instructed to bite and go into excursive movements. Once the acrylic was set the #0 gingival retraction cords were removed from the sulci. The patient was advised that he would be unable to floss this area prior to the seating appointment.

Seating involved anesthesia, removal of the provisionals, and placement of a heavy-weight rubber dam. Gold castings (JRVT Gold 77% Au, 1% Pd, 13% Ag; Jensen Industries Inc, North Haven, CT, USA) were tried in together to verify fit and proximal contacts. Unfortunately, there was inadequate contact between the castings (Figure 5). The distal of tooth 5 was chosen to add to because it looked slightly undercontoured. Gold was added to the distal of tooth 5 using solder (650 Fine; Jensen Industries Inc) and flux (Brown Fluoride Flux; Jensen Industries Inc). A mixture of water, phosphoric acid, and urea (Prevox Liquid; Ivoclar Vivadent Inc, Amherst, NY, USA) was heated in a fume hood and used to remove the oxidation layer from the soldering process.

The inlay castings were seated one at a time beginning with tooth 4. Tooth 4 was seated first so that the mesiobuccal aspect could be accessed for ideal finishing. Separate mixes of zinc phosphate cement (Fleck's Cement; Myerstown, PA, USA) for each tooth were used to give adequate time for finishing of tooth 4. A resin-modified glass ionomer or self-adhesive modified resin cement could have been used.[6,7] The zinc phosphate was slaked with a small amount of powder in the liquid until the liquid appeared clear and was then mixed according to the manufacturer's directions. Cement was applied to the castings, and an orange wood stick (Pearson Dental, Sylmar, CA, USA) along with light tapping with a Gourley mallet was used to seat the castings. A shortened orange wood stick was then used between the castings and lower premolars until the hydraulic pressure of cementation had dissipated. A series of sandpaper disks (medium garnet, fine sand, and fine cuttle) (EC Moore, Dearborn, MI, USA), linen strips (Moyco Dental, Philadelphia, PA, USA), and polishing powders were used to refine the tooth-to-gold interface. Wet #4 laboratory pumice (Kerr Corp, Romulus, MI, USA) was used next with a ribbed prophy cup (Young Dental, Earth City, MO, USA). A light touch rotating from casting to tooth was employed to avoid the uneven removal of tooth and gold if the pumice was used too aggressively or for too long.

Figure 3. *Final preparations.*

The tooth 5 inlay was then seated utilizing the same steps described above. After the #4 laboratory pumice, wet 15-μm aluminum oxide powder (Micro Abrasives Corp, Westfield, MA, USA) with a new ribbed prophy cup was used. Rinsing and drying of the castings and teeth were performed between polishing steps to prevent incorporating scratches late in the sequence. Final polishing was performed dry with 1-μm aluminum oxide powder (Micro Abrasives Corp), again with a new ribbed prophy cup (Figures 6 and 7).

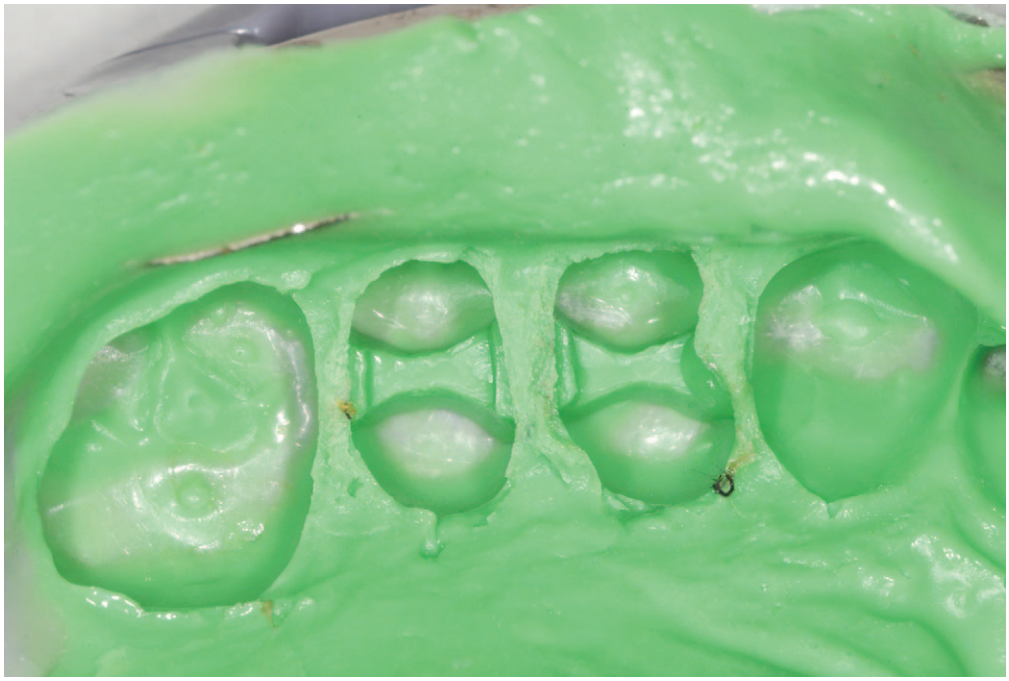

Figure 4. *Impression.*

Figure 5. *Try-in of castings with open contact.*

Once the rubber dam was removed the occlusion was verified with bite registration tape (AccuFilm; Parkell, Edgewood, NY, USA) lightly coated with petroleum jelly (Vaseline; Unilever, Englewood Cliffs, NJ, USA) to improve the visibility of marks obtained. The patient was released after occlusion was confirmed with the patient supine and then again upright.

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Figure 6. *Final restoration—occlusal view.*

Figure 7. *Final restoration—buccal view.*

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Conflict of Interest

Dr Hess, author of this manuscript, certifies that he has no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article except for personal interests in The Academy of RV Tucker Study Clubs.

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