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An intrapost-core design for supragingival crown margin placement

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ABSTRACT—A clinical and laboratory technique that improves the retention and resistance form of a full veneer crown without subgingival margin placement is described, together with two case reports.

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Introduction

Retention and resistance form in crown and bridge prosthodontics can be enhanced by increasing the length[1] of axial walls which often results in locating crown margins subgingivally. However, the presence of subgingival crown margins has been shown to be a contributing aetiological[2,3] factor in periodontal disease.

Retentive and resistive crowns have been designed for supragingival margin placement on vital teeth.[4] This paper describes an intracoronal design for non-vital teeth containing a cast post-core, suitable for supragingival margin placement of full crowns.

Technique

(a) Intra-core pin for anterior crowns

Some anterior teeth requiring a post-core and crown lack a long vertical lingual axial wall below the cingulum which is necessary for retention and resistance form. To circumvent subgingival margin placement in such a tooth an intrapost-core pin is placed for the required retention and resistance form.

The pin channel is drilled with a 0.6 mm twist drill* in the completed post-core Type C gold alloy prior to cementation. The twist drill can be used either in a contra-angle handpiece by the dentist or in a milling machine by the technician. Cutting efficiency is increased by lubrication† and the pin channel is located on the lingual surface as close as possible to the incisal edge, parallel with the long axis of the crown preparation and within the confines of the post. After the desired depth is reached, approximately 4 mm, the pin channel is widened with a tapered fissure steel bur No. 701 to increase the surface area and thickness of the pin (Fig. 1a). A twist drill is used because it is designed for end cutting and penetrates Type C gold alloy with ease. The channel is not prepared at the wax pattern stage because the sprue is often placed in this position, also the angulation of the axial walls may change after polishing the core.

(b) Intrapost-core well for posterior crowns

Some posterior teeth requiring a post-core and crown lack occluso-gingival height. To ensure correct position of the margin in a short crown an intrapost-core well is placed for the required retention and resistance form (Fig. 1b).

The occlusal well is prepared in the body of the core, usually at the wax pattern stage, using a No. 701 tapered fissure steel bur. The well can be any eccentric shape, aligned with the long axis of the crown preparation, and approximately 2.5 mm in depth occluso-gingivally.

[1] Shillingburg HT, Hobo S, Whitsett LD. Fundamental of fixed prosthodontics. 1st ed. Berlin: Die Quintessenz, 1976:71.

[2] Waerhaug J. Histologic considerations which govern where the margins of restorations should be located in relation to the gingiva. Dent Clin N America 1960;4:161-76.

[3] Silness J. Periodontal conditions in patients treated with dental bridges. 3. The relationship between the location of the crown margin and the periodontal condition. J Periodont Res 1970;5:225-9.

[4] Behrend DA. Ceramometal restorations with supragingival margins. J. Pros Dent 1982;47:625-32.

*__V.I.P. pin kit.__ Whaledent International, New York.
†__KaVo oil__, KaVo. Biberach, West Germany.

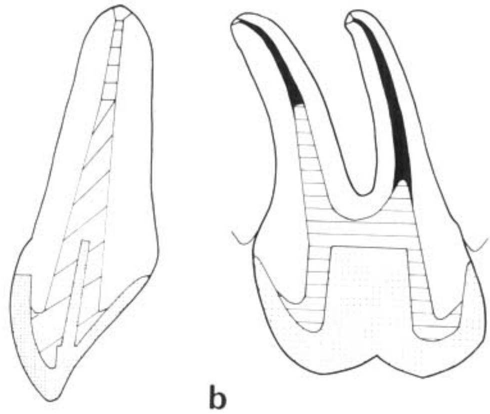


Fig. 1.—a, Diagram of a maxillary canine, short inciso-gingivally, with a sloping palatal wall restored with an intrapost-core pin crown (dotted area), postcore (oblique hatching) and root filling (transverse hatching). b, Diagram of a mandibular second molar, tilted mesially, with a sloping short distal wall restored with an intrapost-core well crown (dotted area), postcore (horizontal hatching) and root filling (black area).

Fig. 2.—Buccal view of the failed bridge with non-precious alloy span from 15 to 18, and temporary crown on non-vital 13.

Case reports

Case 1

(a) Examination and treatment planning

A man, 45 years of age, required replacement of a loosened bridge for the missing 14 and 16. The remaining retainers of the five unit fixed bridge were a full veneer non-precious alloy bridge from the 15 to the 18 with a temporary crown on the non-vital 13 (Fig. 2).

Detailed oral examination included a functional occlusal analysis which revealed a steep 13 guided lateral occlusion with disclusion of other teeth. No occlusal interferences were identified but the patient admitted having a clenching habit but was free of temporo-mandibular joint or myofacial symptoms. The cuspal eminences of the posterior teeth were flattened due to this habit and dietary preferences. The palatal surface of the 13 was sloped as the deep overbite and wear had abraded the cingulum.

After assessment of the occlusion and the anticipated retention and resistance form of the abutments, a five unit compound bridge was designed with retainers on the 13, 15 and 18. The anterior section of the bridgespan was a three unit fixed ceramo-metal bridge from the 13 to the 15 with an intrapost-core pin in the 13 and a keyway‡ on the distal of the 15. The posterior section of the bridge span was a two unit fixed-movable Type C gold bridge

‡Ney mini-rest. J. M. Ney Co., Bloomfield, Connecticut, U.S.A.

Fig. 3.—Buccal view of prepared abutments of 13, 15, and 18. Note extrinsic stains caused by tarnish and corrosion products from non-precious alloy bridge.

Fig. 4.—Palatal view of the bridge at try-in. Note, keyway, equigingival or supragingival margins and sloping palatal wall reproduced to accommodate the occlusion.

from the 18 with a key‡ to the distal of the 15. An acrylic facing formed the buccal surface of the 16 gold pontic.

(b) Preparation

At the first preparation appointment the 13 and 15 were prepared for porcelain bonded to metal crowns and aligned with each other. A direct post-core acrylic§ wax pattern was fabricated for the 13 and cast in Type C gold. After fitting the post-core and aligning it with the 25, an intrapost-core pin channel was drilled using a contra-angle handpiece as described.

After cementing the post-core in the 13 with zinc phosphate cement the 18 axial walls were prepared as parallel as possible and aligned to the anticipated 15 distal keyway. All crown margins were placed, where possible, supragingivally (Fig. 3).

(c) Impression

A full arch polysulphide impression was taken and a precision plastic No. 701 point|| used for an impression of the intrapost-core pin channel and the bridge fabricated.

(d) Try-in and cementation

The bridge was tried in and appropriate adjustments made for aesthetics, occlusion, contact point, gingival and mucosal relationships (Fig. 4). A cuspid rise was maintained for the 23 so that the lateral occlusion was free of contralateral non-working contacts. The bridge was soft cemented with zinc oxide-eugenol cement and petroleum jelly for a day to allow the patient to discover any potential occlusal interferences before final cementation.

There were no signs of occlusal interference and the two sections of the compound bridge were cemented with zinc phosphate cement in two stages, first the three unit section and following set the two unit section. The patient was instructed to clean daily under the bridge and adjacent gingival crevices with dental floss aided with a bridge dental floss threader.¶ The bridge has been in service for

§**Duralay**, Reliance Mfg Co., Detroit, Michigan, U.S.A.
||**KAE**, S. S. White, Sydney, Australia.
¶**Eez-thru threaders**. J. O. Butler Co., Chicago, U.S.A.

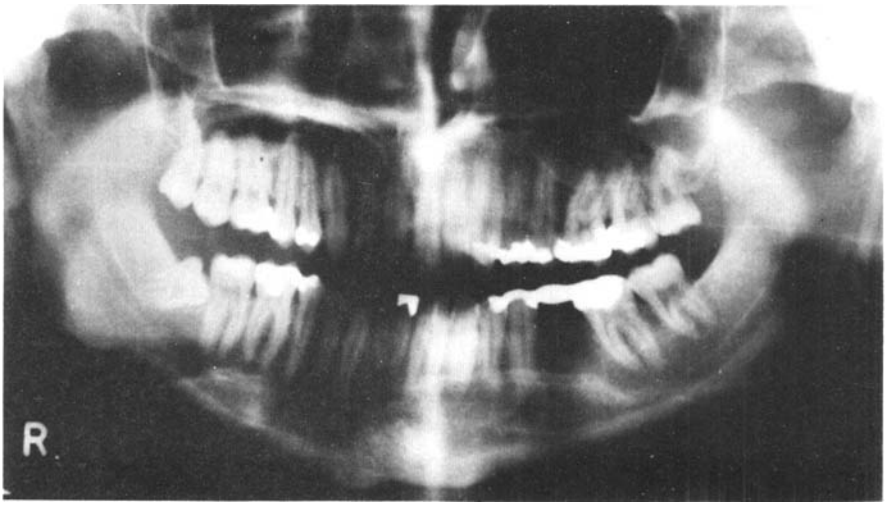


Fig. 5.—Orthopantomograph of non-retentive bridge illustrating inlay retainers for 34, 35, 37, with a 36 hygienic pontic.

four years and the patient has attended yearly for prophylaxis and fluoride application.

Case 2

(a) Examination and treatment planning

A man, 21 years of age, required replacement of a loosened bridge for the missing 36. The retainers of the four unit fixed bridge were inlays on the 34, 35 and 37 (Fig. 5).

Detailed oral examination included a functional occlusal analysis which revealed a 33, 34 and 35 guided lateral occlusion with disclusion of other teeth. It was also found that 37 was non-vital. The mesio-distal width of the pontic span was smaller than an average width 36 as the 37 had tilted mesially. The occluso-gingival height of the 37 was small and the distal wall sloped mesially (Fig. 6).

After assessment of the occlusion and the anticipated retention and resistance form of the abutments, a three unit fixed-movable Type C gold bridge was designed for the 35 and 37. The inlay preparation of the 34 was restored with a disto-occlusal amalgam.

(b) Preparation

The non-vital 37 was endodontically treated using apico-lateral condensation of gutta percha for the mesial canals and a sectional vertical condensation technique for the distal canal. During the endodontic therapy the distal canal was prepared for a tapered cast post-core followed by a full veneer preparation.

The 35 was prepared to accommodate a three quarter crown with a Shillingburg[5] shoulder bevel design on the buccal cusps. The existing box forms from the previous inlays were retained with the design. All crown margins were placed, where possible, supragingivally.

A full arch polysulphide impression was taken and this included the post canal preparation of the 37.

(c) Technical procedure

A post-core wax pattern was fabricated and with the aid of a milling machine a kidney shaped well was drilled as described above prior to casting in Type C gold (Fig. 7).

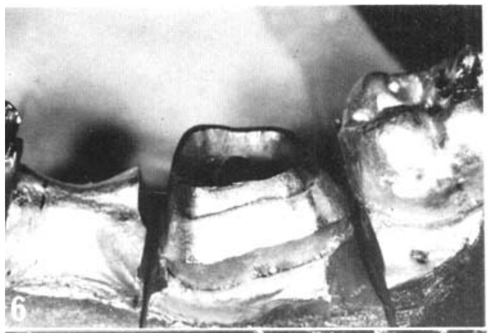
A keyway was milled into the distal surface of the three quarter crown pattern prior to casting in Type C gold. The bridge was fabricated in the usual manner with a hygienic designed pontic.

(d) Try-in and cementation

The bridge was tried in and appropriate adjustments made for the occlusion, contact areas and crown contours. A partial group function in lateral occlusion was re-developed on the 33, 34 and 35 with disclusion of other teeth. The bridge was soft cemented with zinc oxide eugenol cement and petroleum jelly for a day to allow the patient to discover any potential occlusal interferences before final cementation.

The patient returned and a small centric relation to centric occlusion slide was detected and adjusted. The two sections of the fixed-movable bridge were cemented with zinc phosphate cement in two stages, first the three quarter

[5] Shillingburg HT, Hobo S, Fisher DW. Preparations for cast gold restorations. 1st ed. Berlin: Die Quintessenz, 1974;67-78.



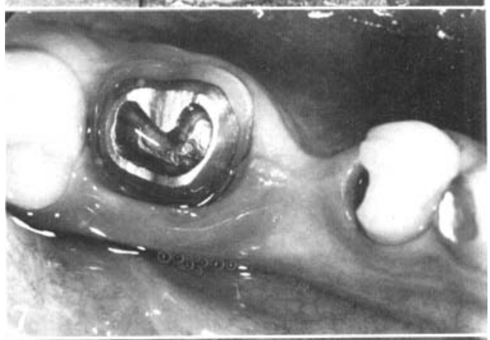


Fig. 6.—Buccal view of tilted 37 abutment with post-core. Note sloping distal wall and small occluso-gingival height. Fig. 7.—Occlusal view of 37 intrapost-core well crown preparation, three-quarter crown preparation of 35, and disto-occlusal amalgam of 34. Fig. 8.—Buccal view of bridge in left lateral working occlusion. Note re-developed point contact on buccal cusp of 35 and supragingival margins.

crown and then the post-core and full crown pontic. After cementation the patient was instructed on appropriate oral hygiene. The bridge has been in service for a year and the patient has no complaints concerning the hygienic pontic design (Fig. 8).

Discussion

This technique of developing retention and resistance form within a post-core has been used successfully in the construction of crown and bridge units at the University of Queensland Dental School. The technique avoids the placing of subgingival margins, it simplifies the making of the impression, temporary crown construction and the finishing and adaptation of cast margins.

An alternative method of developing retention and resistance form for small height crowns is the use of the one piece post-core crown. However, this method is to be avoided in view of the difficulty associated with replacement of such a one-piece restoration.

The technique of drilling a pin channel with a twist drill has been used effortlessly in both Type C gold and non-precious alloy. The ease of drilling the pinhole relates to the use of oil, a necessary lubricant for cutting metal, and a twist drill, which is designed for end cutting.

The intrapost-core pin acts like a small dowel and so provides optimal retention and resistance form because of its central location and large surface area and diameter. The intrapost-core well develops optimal retention and resistance form because of its eccentric shape and extremely large surface area internally. Such crowns made with either a well or pin have both intracoronal and extracoronal elements for optimum retention and resistance form.

Conclusion

The case reports describe the use of both the intrapost-core pin and well in bridge design of abutments with small occluso-gingival heights and tapered walls.

An intrapost-core well and pin is a successful design that avoids the placement of subgingival margins while using an existing post-core and conserving tooth structure for optimal retention and resistance form. The design also reduces fabrication problems by providing two different paths of withdrawal, one for the cast core and the other for the intra-core pin element.

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