Volume 29,
No. 2

The indirect index for soldering bridges

M. Darveniza, M.D.Sc., F.R.A.C.D.S.

Lecturer in Operative Dentistry, Dental School, University of Queensland

ABSTRACT—A laboratory technique suitable for recording the relationship of bridge parts and then verifying the index in the mouth prior to soldering and its application to a 3-unit bridge is described.

(Received for publication September 1982.)

Introduction

Parts of a bridge are related either clinically by the dentist, the direct index, or by the technician in the laboratory, the indirect index, to assemble the parts and invest them for soldering.

To form a direct occlusal index the dentist seats the bridge parts on the teeth and usually either makes a plaster impression record[1] or uses a self-curing acrylic resin record from which the technician fabricates the soldering assembly. To form a conventional indirect occlusal index for immediate soldering the technician assembles the bridge parts from the master model with either a quick-cure acrylic resin[1] or sticky wax and impression plaster.[2]

Errors attribute to both types of index for soldering which are undetectable until the final bridge is tried in the mouth.

In view of the problems associated with occlusal indexing, a technique has been developed combining the advantages of both types of procedures and improving the end result.

Technical procedures

The impression of the bridge is silver plated and precision screw dowel pins* used in the construction of the model, if individual dies are to be used; alternatively, if margins are accessible, a one-piece bridge die with conventional dowel pins is used (Fig. 1).

The components of a bridge wax pattern are the retainers, connectors and pontic. They are constructed, in this case, with a view to producing one soldered joint. One of the retainers, usually the Type C gold alloy or partial veneer, is constructed first and waxed so that a connector is formed that allows a favourable size and shape for beam strength and a suitable design of gingival embrasure for optimum oral hygiene. The cast retainer is contoured and polished with a rubber wheel with particular attention to shaping the connector in readiness for a soldered joint (Fig. 2). The remaining retainer and pontic are constructed as a one-piece casting using a resin reinforced wax pattern technique.[3] During this procedure wax is melted directly onto the contoured cast connector. The one-piece retainer/pontic is completed, with porcelain veneering where indicated, prior to preparing the bridge parts for the occlusal index.

The preparation of the model before indexing involves first freeing the contact areas adjacent to the retainers, with a sandpaper disc, and then grinding the ridge until a space exists between the completed pontic and model. This preparation although simple is mandatory so that

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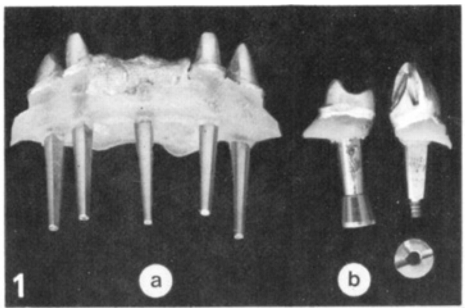
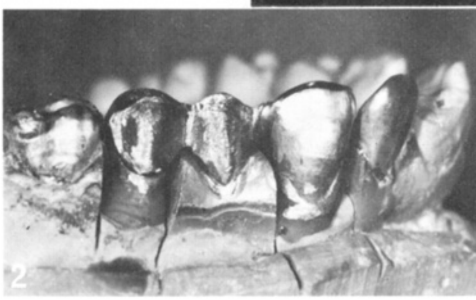
[1] Kornfeld M. Mouth rehabilitation. 2nd ed., St Louis: CV Mosby, 1974:560-4.

[2] Shillingburg HT, Hobo S, Whitsett LD. Fundamentals of fixed prosthodontics. Berlin: Die Quintessenz 1976:304-7.

* G. M. Ney Co., Blomfield, Connecticut, U.S.A.

[3] Darveniza M, Martin JR. One-piece casting for fixed bridgework. Aust Dent J 1982;27:5-10.





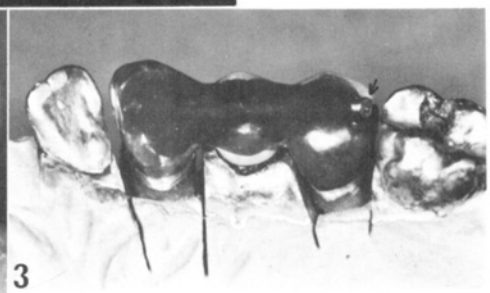


Fig. 1.—Two types of die systems are used, either the one-piece bridge die (a) which includes abutments and pontic using tapered dowels or the precision screw dowels (b) for individual dies. Fig. 2.—The pinledge with completed connector is cast first and then the crown/pontic waxed to the connector which has a large gingival embrasure designed for dental floss threading between the **23** and **24**. Fig. 3.—The indirect index of the bridge illustrating the brass wire (arrow) reinforced **Duralay** resin structure on the model prior to the clinical try-in.

the retainers seat axially and not be inadvertently tilted by interferences at the contact areas or the ridge.

The region of the castings to be soldered is opened up with a sandpaper disc until the space is V-shaped in an occlusal-gingival aspect for ease of solder flow. The occlusal aspect should theoretically be a maximum of 0.25 mm and the gingival end a minimum of 0.13 mm wide[4] depending upon the type of solder and composition of the castings[5] to be soldered. This gap is verified with soldering wire which is approximately 0.2 mm thick.

To link the bridge parts a length of brass wire, 1.8 mm diameter, is cut and bent to approximate the occlusal surface of the bridge span. The retainers are firmly and evenly seated axially with one hand and self curing acrylic resin† is applied across the occlusal surface of the bridge parts, brass wire and joint space to form the indirect index (Fig. 3). After curing, the linked components can be removed and reseated on the model to check path of withdrawal and insertion as well as marginal adaptation of the retainers. After any adjustment the linked bridge is ready for the dentist to verify its relationship in the mouth.

[4] Phillips RW. Skinner's Science of Dental Materials. 8th ed., Philadelphia: WB Saunders, 1982:539.

[5] Rasmussen EJ, Goodkind RJ, Gerberich WW. An investigation of tensile strength of dental solder joints. J Prosthet Dent 1979;41:418-23.

After the dentist has verified the accuracy of the indirect index, adjusted and glazed the bridge, the technician is ready to repeat the index in the laboratory for soldering. Prior to taking this index, each of the cast surfaces that are to be soldered are cut and cleaned with a new sandpaper disc. Resin† and brass wire are used to link the bridge parts but the resin is not flowed into the joint space but following curing this space is filled with a non-residual wax‡ forming the required joint size and shape. The indexed bridge is invested with a soldering investment to form the soldering assembly and then furnace-soldered[1] for optimal strength.[6]

Case Report

(a) Examination and treatment planning

A woman, aged 32 years, was dissatisfied with the appearance of the space of the missing **24** and requested a fixed prosthesis in the form of a bridge (Fig. 4).

Detailed oral examination included a functional occlusal analysis which revealed a left lateral occlusion guided initially by the **23** and then a group function including the **25** and **26**.

† Duralay, Reliance Dental Mfg. Co., Detroit, Michigan, U.S.A.
‡ Stellon, Amalgamated Dental Trade Distributors Ltd., London, England.

[6] Stade EH, Reisbick MH, Preston JD. Pre-ceramic and post-ceramic solder joints. J Prosthet Dent 1975;34:527-32.

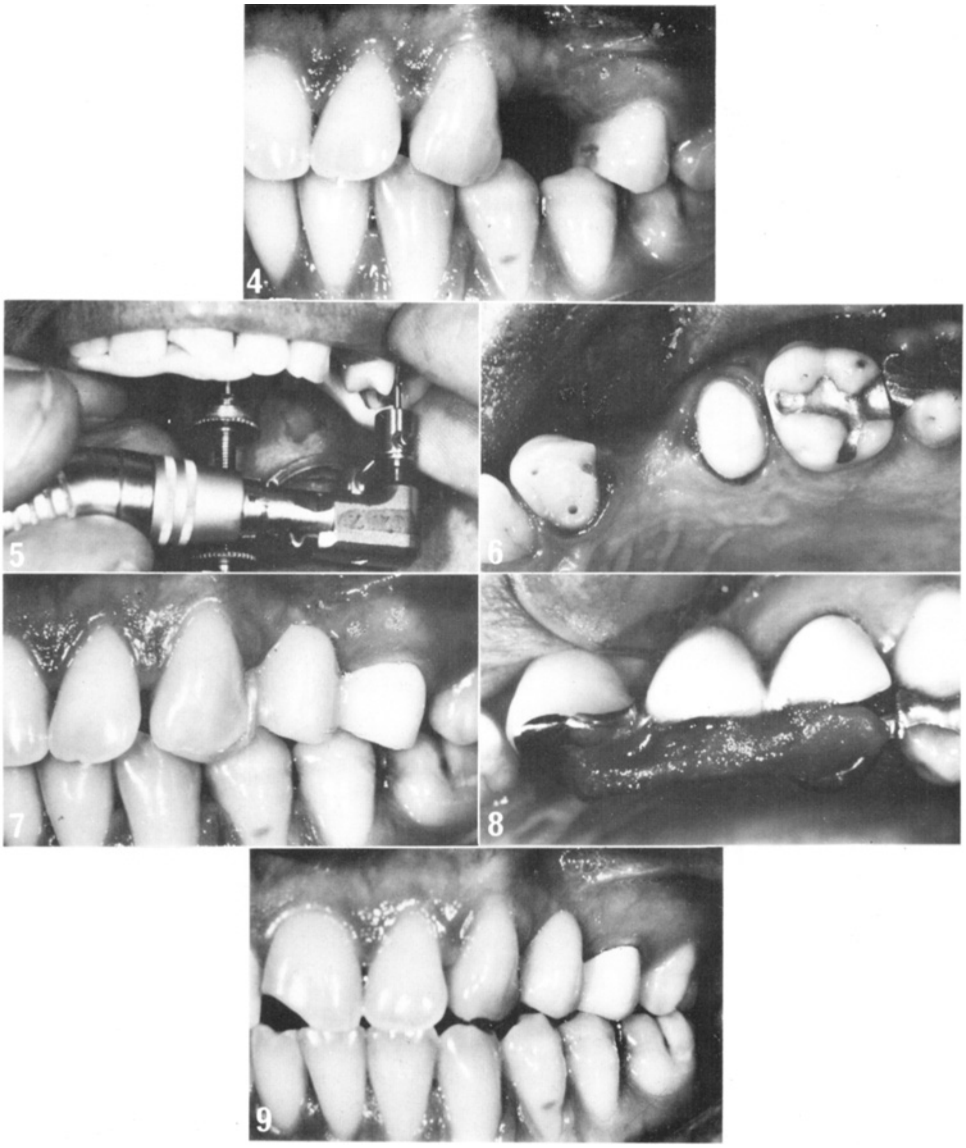


Fig. 4.—A pre-operative view of the missing **24** and adjacent teeth. Fig. 5.—A view of the parallelometer aligned with the **25** prior to preparing pinholes on the **23**. Fig. 6.—An occlusal view of the unilateral pinledge on the **23** and full veneer crown on the **25**. Fig. 7—The temporary acrylic bridge which was constructed intraorally for the **13**, **14** and **15** is seen one week post-operative. Fig. 8.—The indirect index of the bridge at the try-in is used to verify marginal fit and hence the accuracy of the master model prior to soldering the bridge. Fig. 9.—A view of left lateral occlusion six years after treatment and note the group function contact of the bridge.

As the patient had no aesthetic exception to gold showing on incisal edges it was decided to evaluate the case for a partial veneer retainer. There was a space between the **22** and **23** and hence the mesial surface of the **23** was evident from an anterior view. The overall dimensions of the clinical crown of the **25** was comparatively smaller than the **23**. The mesio-distal span of the pontic region was an average width with no curvative of the arch from the **23** to **25**. After assessment of the anticipated retention and resistance form of the abutments and biting forces, a 3-unit fixed-fixed bridge was designed with a unilateral pinledge retainer on **23** soldered to a ceramo-metal pontic and full crown for the **24** and **25**, respectively.

(b) Preparation and temporary restoration

Prior to the preparation appointment a parallelometer§ was employed and aligned so that pin holes could be drilled to suit the long axes of the **23** and **25** teeth. The preparation for **25** was first completed, this included a shoulder-bevel on the buccal margin in readiness for a metal collar.

The salient design features of the unilateral pinledge preparation included an approximately 1 mm palatal reduction, 0.5-0.75 mm incisal reduction, incisal groove, distal proximal groove and mesio-incisal and cingulum tapered (699) 2.5 mm deep pin holes. The pin holes were placed after the parallelometer was re-aligned with the long axis of the **25** (Fig. 5). Each pin hole was initially cut with a 0.6 mm twist drill followed by a tapered 699 fissure bur (Fig. 6).

To maintain arch space and the relationship of the abutments, an acrylic temporary bridge was constructed, as described by Kaiser,[7] and cemented with zinc-oxide cement (Fig. 7). However, no temporary pins were used for the unilateral pinledge the pin holes being plugged with cotton wool.

(c) Impression and technical procedures

A full arch polysulphide impression was taken and the pin holes recorded with prefabricated precision¶ plastic 699 points.

The technical procedures as described were used for the production of models, casting of the bridge parts and fabrication of the indirect index.

(d) Try-in

The linked bridge using the indirect index was tried in (Fig. 8) and prior to confirming marginal accuracy, adjustments were made to the contact area and the mucosal relationship of the pontic.

At this stage the accuracy of the indirect index must be accepted or rejected. In this case the index was accepted, the resin was softened in hot water and removed so that the occlusion and pontic facing could be adjusted. The pontic/crown was now glazed as it is impossible after soldering, since the glazing temperature is higher than the soldering temperature.

The fully adjusted and glazed bridge was returned to the technician for final indexing from the prepared model and soldering. If the indirect index was rejected, the resin would have been removed, marginal accuracy of the retainers verified, and the contact area adjusted and porcelain glazed before making a direct index. The completed restoration is shown in Fig. 9.

§ Prec-in-dent, John Sjoding Co., Upplands Vasby, Sweden.
¶ KAE, S.S. White, Sydney, Australia.

[7] Kaiser DA. Accurate acrylic resin temporary restorations. J Prosthet Dent 1978;39:158-61.

Discussion

The technique described has been used successfully in the construction of forty bridges at the University of Queensland Dental School. The use of this technique simplified the clinical appointment and has resulted in bridges with excellent marginal adaptation.

This occlusal index technique eliminates the principal errors associated with the direct and indirect index which arise from movements on the loose bridge parts. The principal errors associated with the indirect index come, firstly, from movement of the bridge parts during soldering the link-up and secondly, from a mistrust of the accuracy of the master model.

This movement is largely related to not relieving the contact areas of teeth adjacent to the retainers nor relieving the die in contact with the mucosal aspect of the pontic prior to the link up. With this approach an indirect index can be verified at a clinical try-in to check inaccuracy in the master model, prior to soldering.

In this unilateral pinledge retainer described, cast tapered pins were used because of the practical ease of bridge construction with the benefit of optimal resistance form of tapered pins.

For optimal strength, a one-piece casting is the method for choice especially in regions of high bending moments and torque. Consequently, if there is a need for soldering it is preferable that a minimum number of joints should be employed and strategically located away from the centre of the span.

Conclusion

An occlusal indexing technique suitable for technician and dentist prior to soldering has been described. It produces a soldered bridge with accurate marginal adaptation to the abutment teeth while simplifying clinical procedures eliminating gross errors of recording and assembling the parts of the bridge.

A case report demonstrates an example of the procedures and the satisfactory result achieved.

Acknowledgements

I would like to express my thanks to Dr B. A. Junner for his clinical guidance and advice and J. Martin and K. Cheong, Ceramists, for their help and technical support.

Address for reprints:
The University of Queensland,
Dental School,
Turbot Street,
Brisbane, Qld., 4000.