The Milled Implant Bar:  
An Alternative to Spark Erosion

(La barre d’implant fraisée : une solution de rechange à celle usinée par électro-érosion)

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Sommario
Les patients qui ne peuvent tolérer la couverture complète du palais dur, ou dont les arcades maxillaires sont mal formées à cause d’anomalies congénitales, d’anomalies du développement ou de complications chirurgicales, peuvent être incapables de porter une prothèse complète classique. Ces patients peuvent être traités avec succès au moyen de prothèses implanto-portées ne couvrant qu’une partie minimale du tissu palatin. Les pièces usinées par électro-érosion permettent de fabriquer des restaurations très précises qui peuvent s’adapter à de tels implants. Cependant, le coût de ces pièces est si élevé que bon nombre de patients ne peuvent y avoir recours. Cet article propose une solution de rechange, qui s’appuie sur les techniques perfectionnées utilisées pour les prothèses partielles amovibles et qui peut donner des résultats comparables à ceux obtenus avec les pièces usinées par électro-érosion, mais à une fraction du coût. Nous décrivons les exigences cliniques de cette méthode et les procédures de préparation en laboratoire.

Mots clés MeSH : dental casting technique; dental prosthesis design; jaw edentulous, rehabilitation

© J Can Dent Assoc 2002; 68(8):485-8
Cet article a été révisé par des pairs.
removable partial dentures, can offer similar results at a fraction of the cost.²

**Initial Clinical Procedures**

Surgical preparation for implant placement in the edentulous maxilla often entails sinus elevation and bone grafting to create adequate bone to hold the implants.³ The techniques for these procedures are adequately described in the dental literature and are a standard of practice for oral surgeons and periodontists who place implants.⁴ The literature indicates that at least 4 to 6 implants should be placed.⁵,⁶ There is no particular advantage to placing implants in the anterior region if the posterior implants are well integrated and joined with a bar equivalent. In fact, implants in the anterior region often pose problems for the restoring dentist, as the space requirements for proper placement of anterior teeth may be violated.

**Impressions**

A preliminary impression, of sufficient quality to allow fabrication of a temporary denture base, is made. On this temporary base, accurate jaw relation measures are recorded. For both esthetic and functional reasons, the final position of the denture teeth must be established before the implants are placed. A variety of surgical stents can be made from this setup to inform the surgeon of the desired implant positions.

The final impression for either type of denture superstructure is the same. The master cast should have implant analogues, which ideally are perfectly related to each other in the master cast, so that the initial fabrication of the components can proceed. The master cast is mounted, with an autopolymerized resin base, in centric relation to the opposing cast. A tooth set-up is then completed for the patient's approval, so that the final position of the bar can be determined. An occlusal index is formed to allow the denture teeth to be repositioned on the master cast at any time in the construction process.

**Framework Construction**

The gold cylinders or UCLA-type abutments are placed on the laboratory analogues with either wax or a combination of autopolymerized resin and wax on their outer surfaces. The selected bar forms are added to the waxed cylinders (the Hader Bar, Attachments International, San Mateo, Calif., is a commonly used bar form). The buccolingual position of the bars is determined with reference to the desired final tooth position.
casting will be easier to fit (out with a taper of 6° to 8° so that the chrome cobalt over-
implant head and the desired occlusal plane. The labial surfaces are not milled. The bar substructure can be
parallel guiding planes on the lingual surfaces of the gold cylinders. The actual size of the milled surfaces varies greatly, depending
on the space available. The desired final result is a series of parallel-sided milling burrs in a milling machine (for example, the Kavo EW-L-K9 milling machine, Lautkirch, Germany) (Fig. 2). The labial surfaces of the gold cylinders. The retentive elements are then placed on the bar and all
undercuts blocked out before duplication. A palatal bead line is established as it would be for a removable partial-denture casting. The labial surfaces of the bar substructure are blocked out with a taper of 6° to 8° so that the chrome cobalt over-
casting will be easier to fit (Fig. 3). The bar and master cast are duplicated and the denture superstructure is waxed on the refractory cast. The superstructure uses the top of the bar substructure as its vertical stop. Openings are created for the retentive elements so that they can be picked up in the mouth after the denture superstructure is completely fitted to the bar substructure. A palatal external finishing line is created, and retentive beads are placed to retain the resin and the denture teeth. The labial extension of the denture superstructure ends buccal to the ridge crest and before any labial undercut is encountered. The chrome cobalt superstructure is finished by means of very conservative techniques already established for removable partial-denture castings. It is essential that the denture super-
structure contact the milled guiding planes. The fitting of the superstructure to the bar substructure is the most difficult part of this technique, since access to the inner surfaces of the denture superstructure is restricted and the metal is hard to adjust. A disclosing medium (Fit Checker, GC Corporation, Tokyo, Japan) is used to identify areas of premature contact. When finally seated, the frictional fit of the superstructure results in a very stable prosthesis (Fig. 4).

**Final Clinical Procedures**

A variety of retentive mechanisms are available. The cross-section of the labial surface of the bar substructure is round, which allows direct retention by means of a snap undercut mechanism of the clip processed in the denture superstructure. Indirect retention is derived from the parallel nature of the lingual path of insertion.

The retentive elements are attached to the denture superstructure in the mouth to ensure positive contact between the superstructure and the underlying soft tissues. A small amount of autopolymerizing denture resin with all flocked fibres removed is painted onto the housings of the retentive elements, and the elements are placed in a pressure pot to achieve the best possible resin-housing interface. Once set, the housings and their retentive elements are placed on the bar substructure in the mouth, and the denture superstructure is seated and held in place by the clinician while an assistant paints on additional autopolymerized resin to join the housings to the denture superstructure. The fully seated position is maintained until the added resin is fully polymerized. The retention and stability of the denture superstructure is reviewed and, if acceptable, the denture teeth are repositioned from the previously made index. Associated wax contours are added to the denture superstructure for a final try-in.

**Final Laboratory Procedures**

Before processing the denture base resin, the superstructure must be rendered opaque, since the metal often shows as a dark line through the anterior denture base. Tinting the denture base resin to match the patient's gingival colours (with a product such as Kayon Denture Tinting Kit, Kay-See Dental Manufacturing Co., Kansas City, Miss.) completes the creation of the prosthesis.

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Les auteurs n'ont aucun intérêt financier déclaré dans la ou les sociétés qui fabriquent les produits mentionnés dans cet article.

**Références**