

Technique of Framework Cemented on Prepared Abutments to Obtain Passive Fit at Fixed Complete Denture: A 2-Year Follow-Up Report

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The passive fit of implant-supported dentures is fundamental to the rehabilitation success due the absence of the periodontal ligament in osseointegrated implants. Many techniques to obtain passive fit have been reported in the literature, some inaccessible for the clinicians and dental laboratories. This case report presents a technique to fabricate fixed complete dentures aiming at obtain passive fit with reduced time and cost, but without demerit for the aesthetics, function and longevity. A 40-year-old woman was referred for treatment presenting some teeth in the maxilla and an edentulous mandible, reporting eating problems related to instability and little retention of the mandibular complete denture. Treatment based on the reverse planning was performed to guide the rehabilitation with a complete mandibular fixed complete denture and maxillary occlusal plane adjustment. The framework of the fixed complete denture was manufactured luting a cast metal bar above the prepared titanium cylinder abutments using resin cement. The aim of this technique was to obtain a fixed complete denture with passive fit presenting positive esthetic and functional outcomes after 2 years of follow-up.

Key Words: fixed complete denture, implant-supported dental prosthesis, passive fit, case report.

Introduction

The literature suggests the requirement for a passive fit between the prosthesis framework and implant fixtures. The absence of a passive fit in the implant-prostheses interface increases stress concentration on the supporting tissues, due to the intimate bone-implant contact (1-4). A misfit in the denture frameworks can cause many complications, including biological effects such as inflammation of the surrounding tissue, pain, bone deformation and remodeling, continual resorption or even the loss of osseointegration (5). Technical complications include abutment fractures, screw loosening or fractures, and fracture of the framework (6,7).

Potential distortion may arise at any step of the fabrication process of the complete fixed denture. Errors are due to changes occurring during indirect procedures, including taking of impressions, gypsum casts, waxing frameworks, investing wax patterns and casting frameworks. When all the materials are carefully handled, then the compound errors are still relatively small (8). Many techniques to obtain passive fit for the implant-supported prostheses have been reported in the literature, but some of them are inaccessible for clinicians and dental laboratories (9-13).

This case report presents a technique to fabricate complete fixed dentures aiming to obtain passive fit with reduced time and cost, but without demerit for the aesthetics, function and longevity.

Case Report

A 40-year-old Caucasian woman was referred to a private clinic reporting eating problems related to instability and bad retention of the mandibular complete denture. Clinical examination and complete radiographic exam revealed in the maxilla a removable partial denture and seven remaining teeth, and mandibular complete denture over an edentulous mandible (Fig. 1). Tomographic mandibular exam showed favorable bone condition to place implants. After comprehensive evaluation and data collection, a treatment plan was developed for the patient, which included regularizing the occlusal plane of the maxilla and placement of five implants in the anterior region of the mandible to support and retain an immediately loaded mandibular fixed complete denture.

Maxillary and mandibular impressions were made with irreversible hydrocolloid impression material (Cavex ColorChange; Cavex, Haarlem, The Netherlands) and poured with type III dental stone (Herodent; Vigodent, Rio de Janeiro, RJ, Brazil). Record base was fabricated in the mandible cast with self-curing acrylic resin (Clássico Produtos Odontológicos Ltda., São Paulo, SP, Brazil) and occlusion rims were added. The occlusal vertical dimension was established. A centric relation record was performed using zinc oxide eugenol paste (Pasta Lysanda; Lyzanda, São Paulo, SP, Brazil). The casts were mounted in a semi-adjustable articulator (A7 Fix; BioArt, São Carlos, SP, Brazil)

using an arbitrary facebow (BioArt). The selected artificial teeth (Premium; Heraeus Kulzer, Hanau, Germany) were mounted in a corrected occlusal plane (Fig. 2A). Esthetic and functional testing of artificial teeth was performed. The teeth arrangement was duplicated using transparent heat-curing acrylic resin (Clássico) to fabricate the multi-functional guide (Fig. 2B).

Five external hexagon implants (Ø3.75 x 13 mm; P-I Brånemark Philosophy, Bauru, SP, Brazil) were surgically placed in the anterior region of the mandible with sufficient insertion torque of at least 40 Ncm. Intermediary abutments for multiple implant dentures were screwed on the implants

(P-I Brånemark Philosophy). A straight or angulated abutment was selected depending on the angulation of the implant (Fig. 3A). Before suture, five abutment impression copings (Neodent, Curitiba, PR, Brazil) were screwed on the intermediary abutments (Fig. 3B), and joined using metallic cylinders and self-curing acrylic resin (Pattern Resin; GC Corp, Tokyo, Japan) (Fig. 3C) to obtain an index cast model of the implant positions. The assembly was removed and five analogs were screwed for the impression copings (Fig. 3D). The index was poured with type IV dental stone (FujiRock; GC Corp) (Figs. 3E and 3D).

Five titanium cylindrical abutments (Neodent) used for

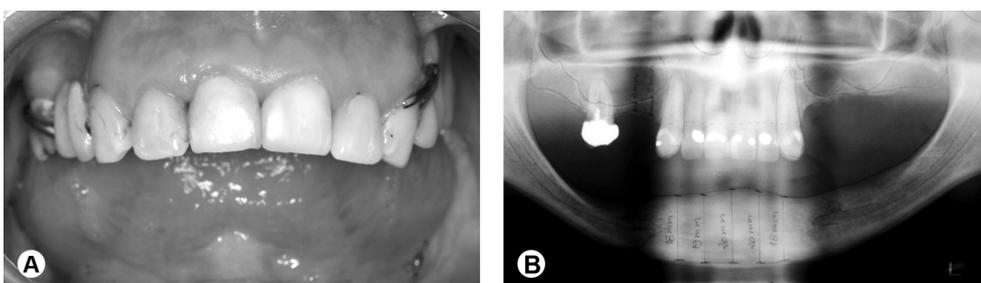


Figure 1. Initial condition showing the use of removable partial denture, 7 remaining teeth in the maxilla and a complete denture in the edentulous mandible. A: Clinical condition. B: Panoramic radiograph.

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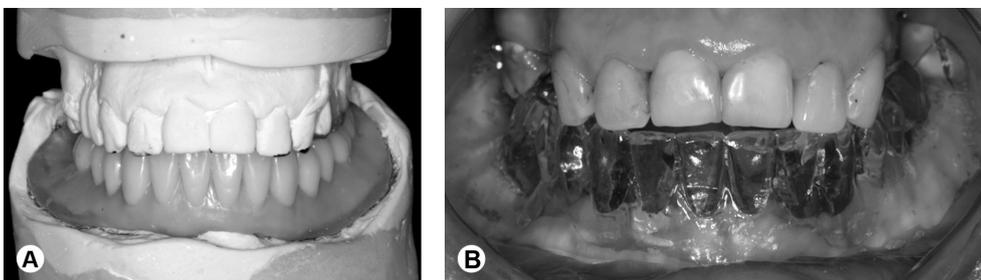


Figure 2. A: Artificial teeth mounted in a corrected occlusal plane. B: Multi-functional guide duplicated from teeth arrangement.

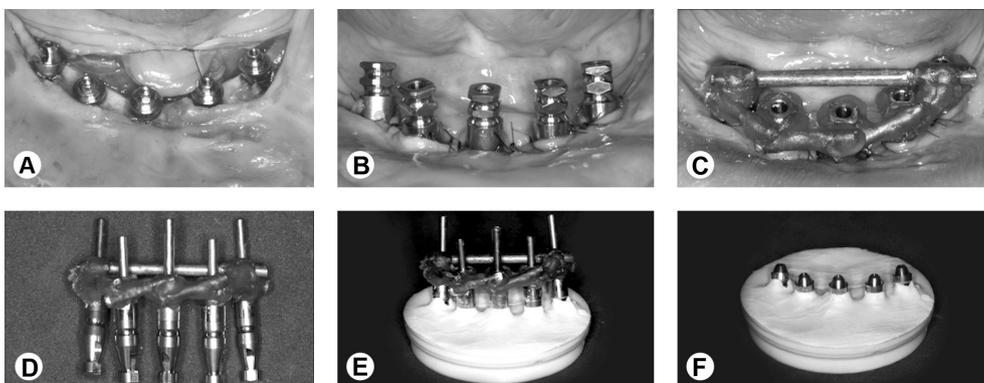


Figure 3. A: Implants and intermediate abutments placed in mandible. B and C: abutment impression copings screwed on the intermediate abutments and joined using metallic cylinders and self-curing acrylic resin. D, E and F: Index model fabrication.

temporary restorations were screwed on the intermediary abutments (Fig. 4A) and joined to the guide using self-curing acrylic resin (Pattern Resin; GC Corp) (Fig. 4B). Impression material (Express XT; 3M ESPE, St. Paul, MN, USA) was placed around the cylindrical abutments to copy the relationship between implant positions and soft tissues (Fig. 4C). Refinement of the centric relation was performed using self-curing acrylic resin (Pattern Resin; GC Corp) in three points, one anterior and two posteriors. After removing from the buccal cavity, the analogs (Neodent) were screwed to the cylindrical abutments. Artificial gingiva was injected around the junction of the cylindrical abutments and analogs, and type IV dental stone (Fujirock; GC Corp) was poured. The protection caps were screwed

on the intermediary abutments. Maxillary impression was performed with irreversible hydrocolloid impression material (Cavex ColorChange; Cavex) removing the partial denture and pouring with type IV dental stone (Fujirock; GC Corp). Postoperative medications and instructions were given to the patient.

The cast models were mounted in semi-adjustable articulator (A7 Fix; BioArt) (Fig. 5) and sent to dental laboratory. The teeth were mounted again with wax and a wall obtained from teeth arrangement. The bar framework was fabricated above the prepared titanium cylindrical abutments (Neodent) using self-curing acrylic resin (Pattern Resin; GC Corp) in wall space with teeth in position (Fig. 6). The bar framework was cast in nickel-chromium alloy.



Figure 4. A and B: Titanium cylinder abutments screwed on the intermediate abutments and joined to the guide using self-curing acrylic resin. C. Impression material placed around cylinder abutments to copy the relationship between implant positions and soft tissues and refinement of the centric relation performed using self-curing acrylic resin.

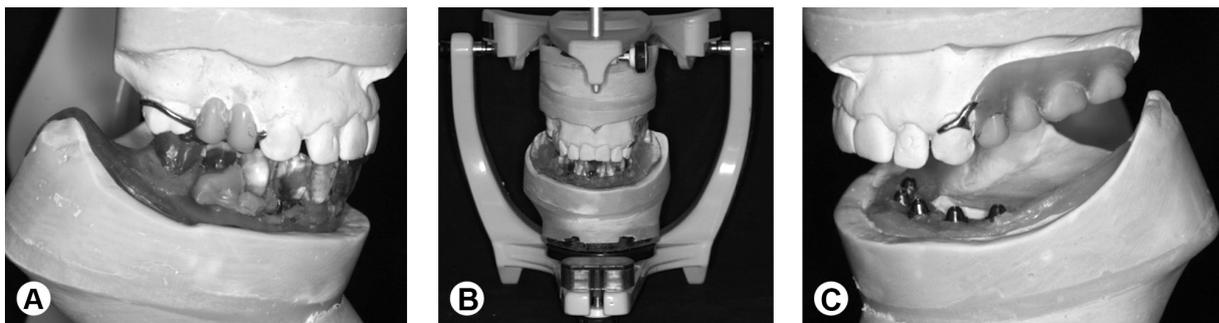


Figure 5. A and B: The cast models were mounted in semi-adjustable articulator using the multi-functional guide. C: Space created to fabricate the denture.



Figure 6. A: Prepared titanium cylinder abutments. B and C: Bar framework fabricated with self-curing acrylic resin above prepared cylinder abutments.

After divestment, the bar was cemented on the prepared cylindrical abutments with resin cement (RelyX U200; 3M ESPE) (Fig. 7). The resin cement was photo-cured during 60 s on each exposed face. The teeth were mounted in wax above the framework (Fig. 8A). The denture was included with heat-curing acrylic resin (STG; Vipi, Pirassununga, SP, Brazil) with a long cycle in 72 °C water bath for 9 h. The denture was divested, and finishing and polishing was performed.

The patient returned after 2 days. The protection caps were removed and the fixed complete denture was screwed above the intermediate abutments (Figs. 8B and 9A). The occlusal adjustment was performed and instructions were given, specifically requesting that the patient use only a soft diet for the initial healing period. Complete radiographic exam was solicited, which showed the fit between the implants and intermediary abutments and denture framework (Fig. 9B).

The suture was removed ten days after the surgical procedure. Four months after placement of the fixed

complete denture, the patient returned for follow-up. After 2 years of follow-up, the clinical examination showed peri-implant health, implants fixture and positive esthetic and function of the fixed complete denture (Figs. 10 and 11A) and a complete radiograph suggested mild bone loss around the implants, but no lesion was observed (Fig. 11B).

Discussion

The technique presented hereby allowed placing an immediate fixed complete denture in less than 48 h to rehabilitate an edentulous mandible. In these cases, immediate loading is commonly used since it provides a high success rate and improves patient comfort (14). Many techniques are reported in the literature to obtain passive fit for fixed complete denture (9-13). However, several of these techniques are expensive and out of reach for the clinicians or dental laboratories. The technique presented in this case report does not require any complex equipment since a dental laboratory with the necessary structure to fabricate conventional dentures and conventional casting

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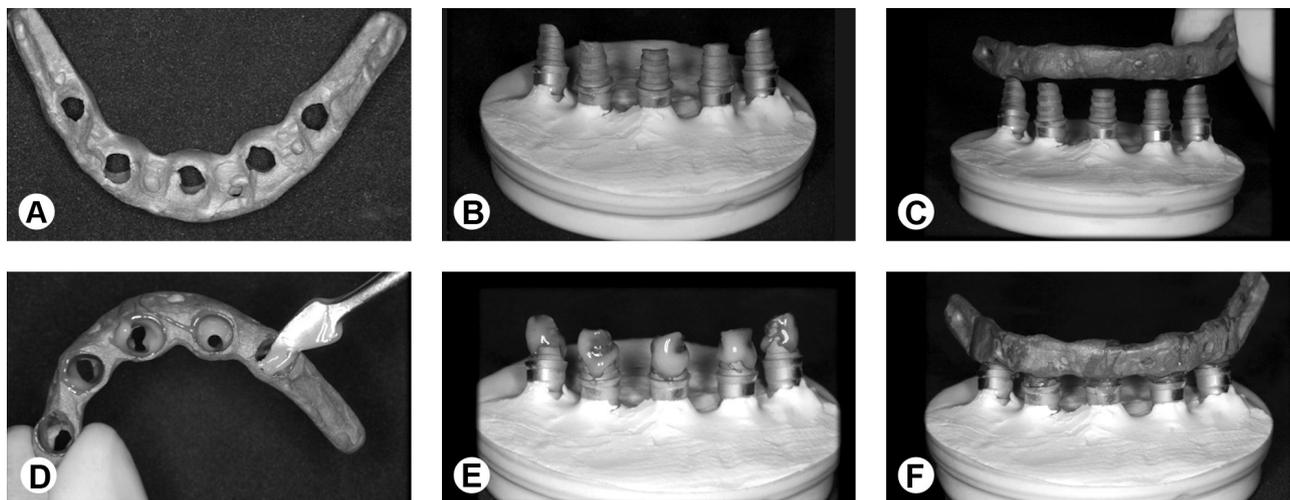


Figure 7. A: Bar framework cast in nickel-chromium alloy. B: Prepared cylinder abutments screwed on the index cast model. C: View of the bar placed above prepared cylinder abutments. D, E and F: Luting of the bar framework above prepared cylinder abutments.

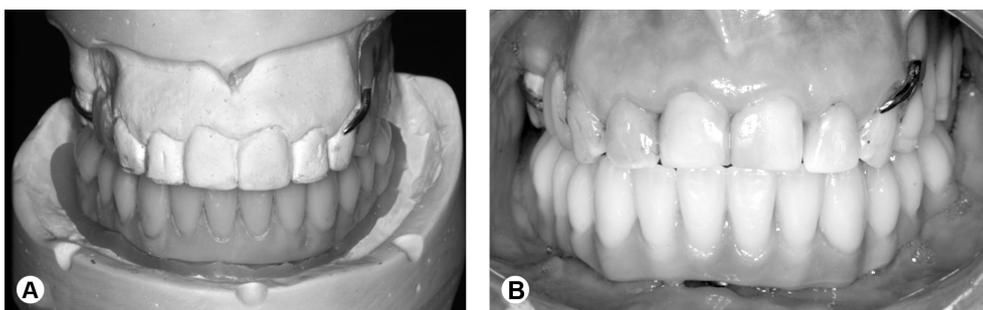


Figure 8. A: Teeth mounted in wax above the framework. B: Buccal view of the fixed complete denture in occlusion.

equipment can fabricate the fixed complete denture.

The frameworks usually incorporate the cylindrical abutments and present the requirement to be sectioned and welded when misfits are found. This procedure requires additional procedures in the dental laboratory and delays for the completion of the final denture. However, if the framework is fabricated with holes for the prepared cylindrical abutments, the final passive fit between the framework and the intermediary abutments can be performed luting the framework to the prepared cylindrical abutments screwed on the index cast using resin cement. The advantage of this technique is that the final relationship between framework and intermediary

abutments is not affected by errors in casting procedures, thereby reducing cost and time.

The denture may be regarded as definitive, even if the gingival acrylic resin requires adjustment to compensate for soft tissue changes (13). In addition, the immediate fixed complete denture incorporates a metal support framework that is required even in the early period of loading, thus preventing fractures of the temporary acrylic resin fixed denture (15-16).

Overall, the technique shows to be efficient to obtain a fixed complete denture with passive fit and presenting positive esthetic and functional outcomes after 2 years of follow-up.

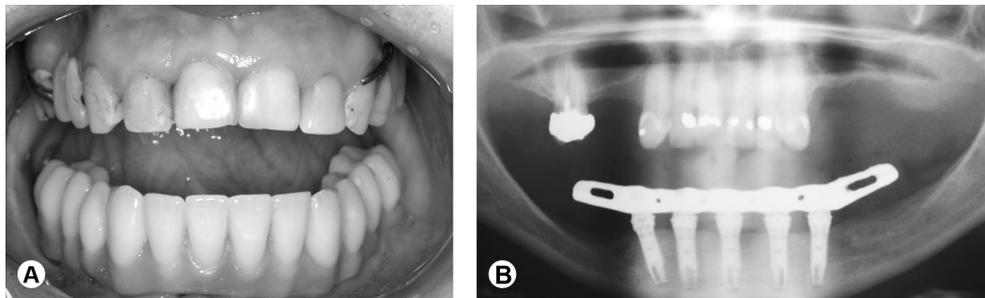


Figure 9. A: Buccal view of the occlusal plane of the fixed complete denture. B: Complete radiographic exam showing fit between the implants and intermediary abutments and denture framework

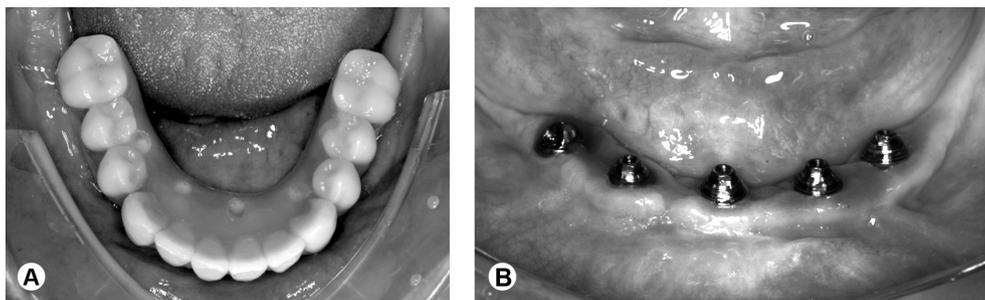


Figure 10. Two years of follow-up. A: Occlusal view of the fixed complete denture. B: Soft tissues and intermediate abutments.

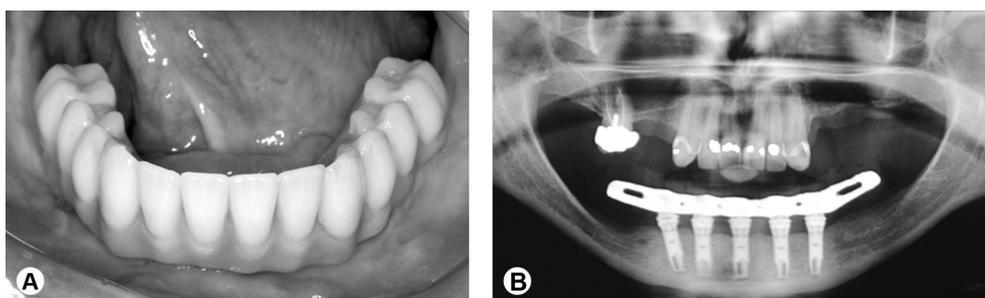


Figure 11. Two years of follow-up. A: Clinical condition. B: Complete radiographic exam.

Resumo

A adaptação passiva de próteses implantossuportadas é fundamental para o sucesso da reabilitação devido à inexistência de ligamento periodontal em implantes osseointegrados. Inúmeras técnicas de confecção da infraestrutura destas próteses tem sido relatadas na literatura, algumas inacessíveis para os clínicos e laboratórios de prótese. Este relato de caso apresenta uma técnica para confecção de próteses totais fixas visando obtenção de adaptação passiva com tempo e custo reduzido, porém sem demérito à estética, função e longevidade. Uma paciente de 40 anos se apresentou para tratamento apresentando alguns dentes na maxila e mandíbula edêntula, relatando dificuldades na mastigação relacionados a instabilidade e falta de retenção da prótese total inferior. Foi realizado um planejamento reverso para orientar a reabilitação com prótese total mandibular fixa e adequação do plano oclusal da maxila. A infraestrutura da prótese total fixa foi confeccionada pela cimentação de uma barra metálica em cilindros de titânio preparados com cimento resinoso. O objetivo desta técnica foi obter uma prótese total fixa com adaptação passiva apresentando resultados positivos em termos de estética e função após 2 anos de acompanhamento.

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