

# A Novel Technique for Replicating the Profile of an Interim Implant-Supported Single Crown on the Definitive Prosthesis

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## INTRODUCTION

Dental implants were introduced as a treatment modality to reestablish masticatory function for the completely<sup>1</sup> or partially<sup>2,3</sup> edentulous patient. The quest for immediate function and immediate esthetic outcome has resulted in several publications involving immediate restoration of dental implants.<sup>4-10</sup> With regard to the partially edentulous patient, placing an interim prosthesis either simultaneously with dental implant surgery<sup>6-10</sup> or during the second stage surgery<sup>11-13</sup> allows the soft tissue to heal according to the contours of the interim restoration.

Various techniques have been proposed to replicate the soft-tissue anatomy obtained during the healing phase.<sup>6,14-18</sup> However, there is no consensus in the literature with regard to the accuracy or reproducibility of any technique aiming at replicating the soft-tissue profile around dental implants. In addition, most of the methods proposed in replicating the peri-implant soft-tissue profile focus on replicating the gingival portion of the interim prosthesis, disregarding the middle and coronal contours that have been intraorally verified during the healing period.

The purpose of the described methodology is to offer an alternative technique in replicating the anatomy of an interim implant-supported single crown to fabricate a custom impression coping and the definitive prosthesis.

## CASE LETTER

A white female patient presented to the Department of Prosthodontic, Instituto Nacional de Ciencias Odontologicas, Rio de Janeiro, Brazil, with a chief complaint of partial edentulism at the area of maxillary left lateral incisor (No. 10; Figure 1a). A root form dental implant had been previously placed at the area of tooth No. 10, which was considered

nonrestorable because of unfavorable facial inclination (Figure 1b). After discussing different treatment options, the decision was made to remove the nonrestorable dental implant and place another dental implant at the area of tooth No. 10 with proper facial inclination.

The surgical procedure was conducted under local anesthesia. The patient was given 1 g amoxicillin 1 hour before surgery. The implant was removed with the assistance of a retriever key (Retriever Key, Neodent, Andover, Mass) to minimize trauma to the adjacent osseous and soft-tissue structure. A new dental implant 3.5 mm in diameter and 11 mm in length (Alvim HE, Neodent) was placed with respect to the ideal 3-dimensional position<sup>19,20</sup> (Figure 2a). To ensure proper implant positioning and angulation, a fully contoured diagnostic wax up was made on a diagnostic cast, and a surgical template was fabricated. After implant installation, a connective tissue graft was performed to improve the quality of the soft tissue.<sup>21,22</sup> A immediate screw retentive interim restoration made by autopolymerized acrylic resin on a prefabricated temporary abutment (Alike, GC, Alspin, Ill) was fabricated<sup>23</sup> to obtain an adequate gingival profile (Figure 2b).

After 6 months of healing and completion of the orthodontic treatment, the patient returned to the dental clinic with a reestablished gingival contour, and the procedure for the definitive restoration was initiated. The emergence profile of the soft tissue was a duplicate of the contours of the interim prosthesis. The described technique consists of replicating the emergence profile of the interim restoration when fabricating the definitive restoration.

An impression of the anatomy of the interim restoration was then made. For this purpose, a stone cube with an implant analogue was used (Figure 3a). The interim restoration was removed and positioned over this analogue. Subsequently, an impression was made with addition silicone (Speedex, Coltene, Cuyahoga Falls, Ohio). The interim restoration was removed after setting time of the impression material.

A custom impression coping was then fabricated by using the addition silicone. An open-tray transfer was positioned in the ensemble, which consisted of the stone cube, the analogue, and the impression made from the interim restoration. Autopolymerized acrylic resin (Alike, GC) was poured to replicate the emergence profile of the interim restoration (Figure 3b). The custom impression coping was positioned into the implant while maintaining the gingival contour that was

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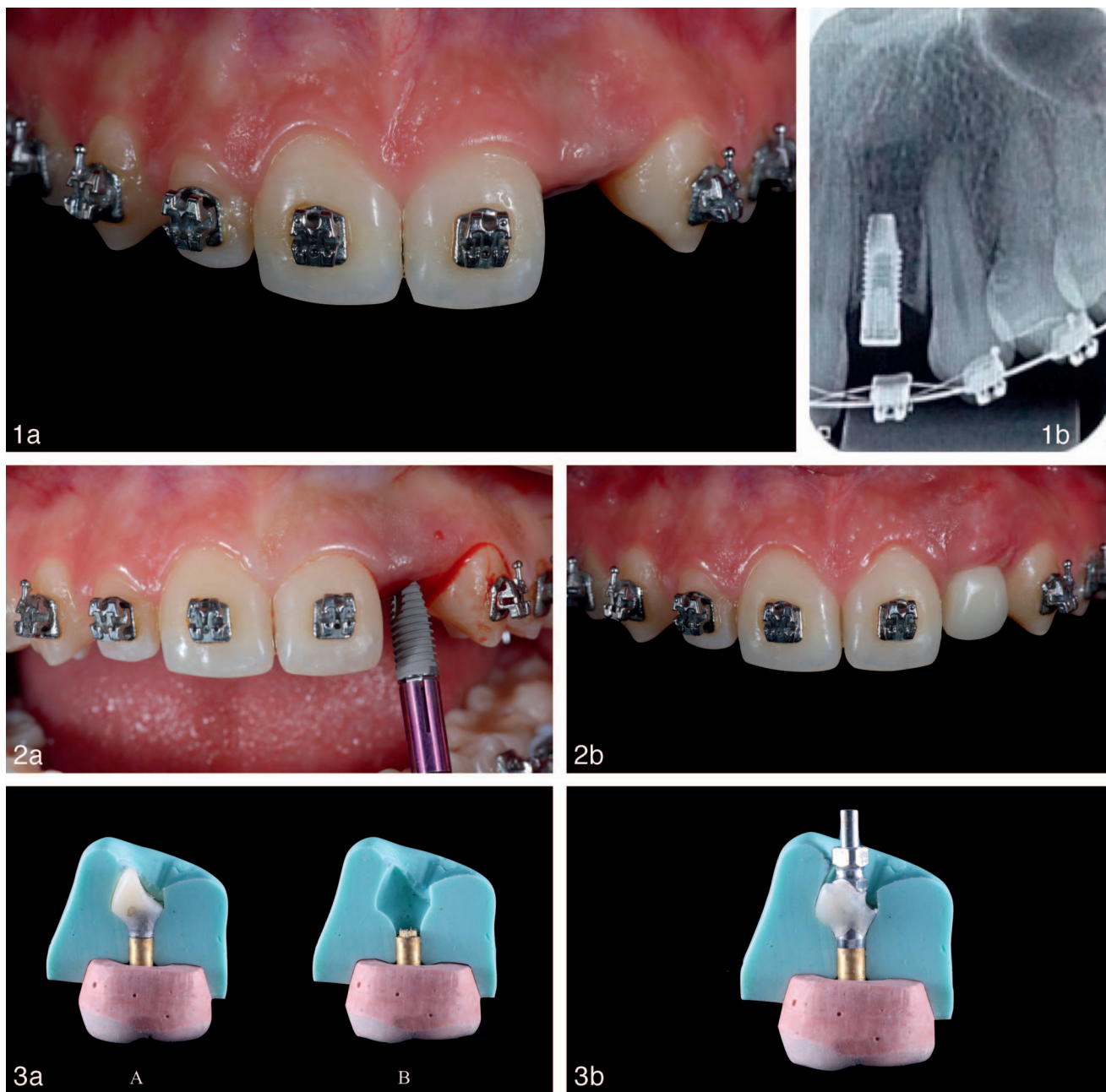
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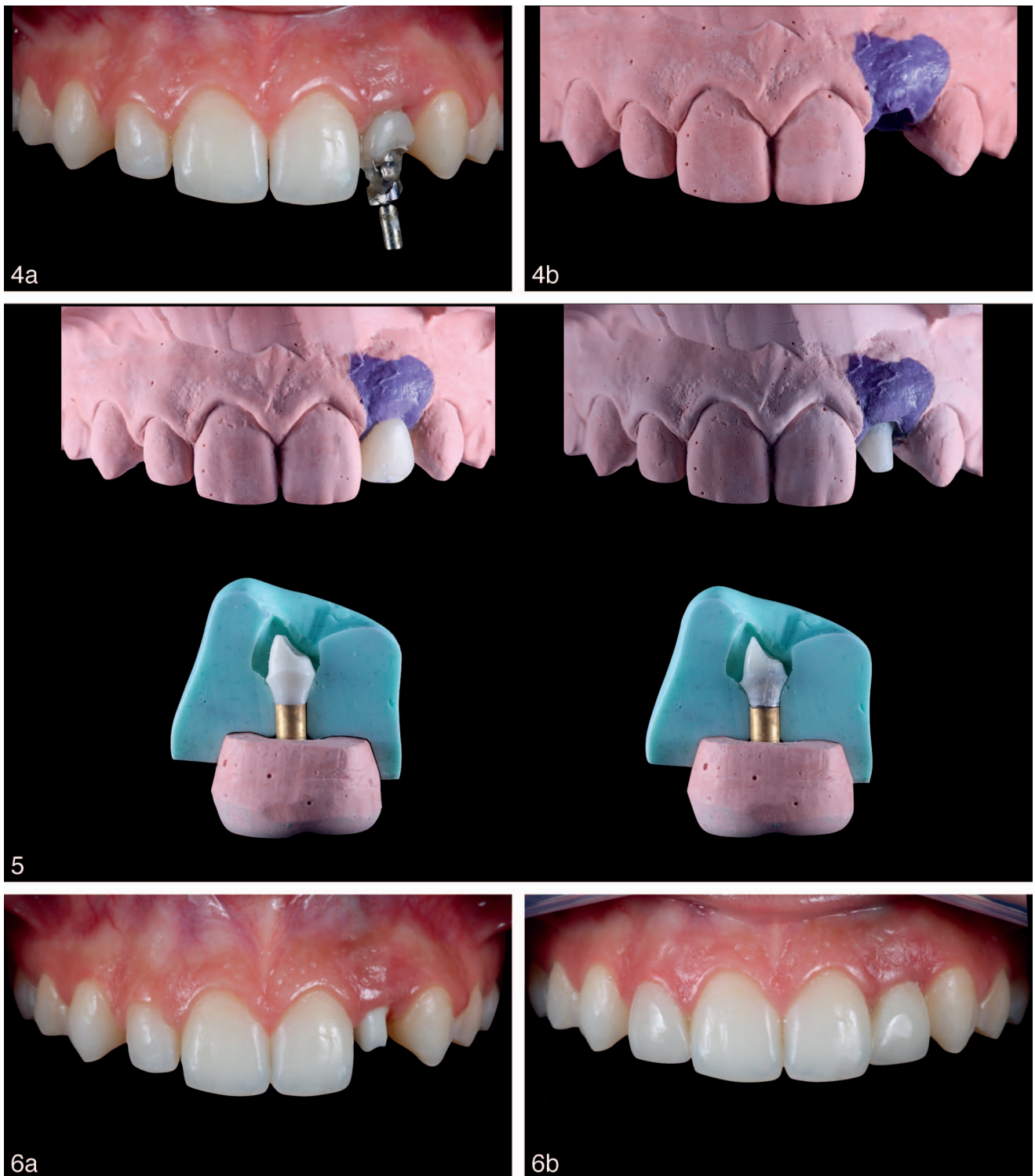


**FIGURES 1–3. FIGURE 1.** (a) Preoperative intraoral illustration. (b) Radiographic preoperative view. **FIGURE 2.** (a) Implant placement. No flap has been reflected. (b) Preliminary healing with the interim restoration. **FIGURE 3.** (a) Stone cube is used to secure an implant analogue. An impression of the interim prosthesis is made by using addition silicone (IAS). (b) A custom impression coping is made with autopolymerized acrylic resin and a prefabricated impression coping. The IAS is used to contour the custom impression coping.

obtained with the interim restoration. The master impression was made with the polyvinylsiloxane (Express XT, 3M, St Paul, Minn) using the single-step technique (Figure 4a). The master stone cast was made using plaster type IV (Velmix, Kerr, West Collins, Calif), whereas polyether (Impregum, 3M) was used for gingival simulation (Figure 4b).

A custom zirconia abutment was then fabricated. Using the stone cube with the IAS, a replica of the interim restoration (RIR) was fabricated with an interim metal abutment and autopolymerized acrylic resin (Alike, GC). The RIR has similar

contours as the interim restoration. The RIR was then positioned in the master stone cast. The contours of the RIR were subsequently reduced to fabricate a maquette laboratory abutment (MLA). The reduction was performed by using the contours of the interim prosthesis as a guide while a 1-mm reduction was performed to provide uniform space for the definitive restoration (Figure 5).<sup>24</sup> The master stone cast and the MLA were sent to the laboratory to fabricate the zirconia abutment. A laboratory scanner was used (D-700, 3Shape, Copenhagen, Denmark) to scan the MLA. A full-coverage crown



**FIGURES 4–6. FIGURE 4.** (a) Custom impression coping, intraoral view. (b) Master stone cast. The gingival contours have been transferred. **FIGURE 5.** The addition silicone is used as a guide to fabricate a maquette laboratory abutment (MLA). **FIGURE 6.** (a) Final zirconia abutment, intraoral view. (b) Definitive prosthesis.

made of lithium disilicate was fabricated as a cementable restoration over the zirconia abutment.

The zirconia abutment was torqued into the implant with 35 N/cm according to the manufacturer’s recommendations

(Figure 6a). A gingival retraction cord (ProRetract, FGM) was inserted in the gingival sulcus to prevent excess cement entrapment into the sulcus. The definitive restoration was cemented with resin cement (Allcem, FGM; Figure 6b).

## DISCUSSION

The described technique offers a clinical and laboratory protocol for replicating the modified interim prosthesis when fabricating a custom impression coping and the definitive restoration. Proussaefs<sup>14</sup> described a technique in which a custom-milled impression coping is fabricated before dental implant surgery according to the ideal contours of a tentatively designed definitive prosthesis. While this technique may minimize the clinical and laboratory steps involved in fabricating a custom impression coping, any deviation of implant placement as compared with the presurgical digital implant positioning may result in an inability to replicate the exact soft-tissue profile. With the described technique, the custom impression coping is made after dental implant surgery and soft-tissue healing.

Replicating the soft-tissue profile obtained during the healing phase into the definitive prosthesis may lead to a low- or no-pressure placement of the definitive restoration. There is a paucity in the literature with regard to the significance of the pressure the definitive restoration applies to the peri-implant tissue upon insertion. Some authors have reported minimal recession of the soft tissue when the definitive prosthesis is made with similar contours as the interim restoration.<sup>6</sup> It could be suggested that placement of a definitive prosthesis with no pressure on the surrounding tissue may lead to reduced or no recession at later stages. A clinical study is needed to validate this hypothesis.

Some authors<sup>6,18</sup> have used the interim implant-supported crown as a custom impression coping before making the master stone cast. While there is no study to evaluate the accuracy and reproducibility of different techniques in transferring the soft-tissue profile on the master stone cast, utilization of a custom impression coping might be more practical because the patient does not have to be left without the interim prosthesis for any period of time.

An alternative and most commonly applied method to fabricate a custom impression coping is to use autopolymerized acrylic resin intraorally around a temporary metal abutment or impression coping.<sup>7</sup> The main limitation of this technique is the difficulty to control moisture intraorally. The operator cannot ensure that blood or saliva is excluded from the space between the metal abutment and the autopolymerized acrylic resin. In addition, the soft tissue might be unstable after removing the interim prosthesis. Applying autopolymerized acrylic resin intraorally around the peri-implant soft tissue does not prevent the soft tissue from collapsing. This will lead to an incorrect soft-tissue profile on the master cast. Therefore, the contours of the definitive prosthesis will not be similar to the soft-tissue profile obtained during the healing phase.

Intraoral scanning has become popular in recent years. Use of an intraoral scanner to record the soft-tissue profile around dental implants is a valid treatment modality.<sup>25</sup> The tendency of the soft tissue to collapse around dental implants when the interim restoration is removed may impose a limitation on this technique.

In the described clinical situation, a zirconia abutment was used because it provides better esthetic outcomes than metal abutments<sup>26–28</sup> and better long-term stability of the soft

tissue.<sup>29</sup> However, the described technique can be used with any abutment and crown.

In summary, the described technique offers a clinical and laboratory protocol to replicate the soft-tissue profile of the profile of the interim implant prosthesis into the definitive restoration. A clinical study is needed to evaluate the reproducibility and accuracy of the described technique.

## ABBREVIATIONS

IAS: addition silicone  
 MLA: maquette laboratory abutment  
 RIR: replica of the interim restoration

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