

# Planning: The key to obtaining aesthetic and functional results in implant-supported restorations

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**Abstract:** *Several factors determine the success of functional and esthetic outcomes with implant-supported prosthetic replacement. Team work is essential as from the time of diagnosis, along with commitment of all members involved in solving different situations daily arising in dental practice. Meticulous planning is the key to achieve the desired result, respecting an interdisciplinary practice and using clinically scientifically acceptable evidence-based protocols. Thus, this article presents a case of patient-dentist-dental hygiene technician integration in the quest for sustainable results in the long run.* **Keywords:** *Dental implants. Implant-supported prosthetic replacement. Transmucosal profiles. Temporary teeth. Esthetics.*

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## INTRODUCTION

Presently, implant-supported prosthetic replacement is a common approach to treat tooth loss; however, in order to ensure patient's satisfaction, some functional as well as esthetic requirements must be fulfilled.<sup>1-5</sup>

The increasing demand for esthetics requires peri-implant soft tissue color and contour to be in harmony with all surrounding elements, since hard and soft tissues might be subjected to supplementary treatment at the implant site.

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» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

This type of procedure is considered as advanced or complex, as it requires meticulous preoperative planning and precise prosthesis-guided surgery based on a prosthetically-guided approach.<sup>6</sup>

Presently, clinicians have protocols previously validated for immediate, late or early implant placement available.<sup>7,8</sup>

After tooth extraction, hard and soft tissues undergo significant changes as a result of healing.<sup>9-12</sup>

Several factors exert influence over peri-implant soft tissues, although only a few have in fact been studied: peri-implant biotype, buccal bone height and width, and tridimensional position of implants.<sup>13,14</sup>

Bone wall height has direct influence on the position of the mucosa over the buccal wall, whereas bone wall thickness has an impact over buccal convexity of the alveolar process at the emergency profile of an implant-supported prosthetic.<sup>15</sup>

Occasionally, uncommon situations arise, for instance, the presence of impacted

teeth at the treated site. In these situations, the clinician must assess potential risks and give priority to predictable techniques, so as to achieve the desired result.

### **CASE REPORT**

A young 22-year-old male patient with absence of right maxillary central incisor caused by avulsion as a result of trauma. The patient underwent emergency treatment during which the crown of the lost tooth was temporarily bonded to neighboring teeth (Fig 1).

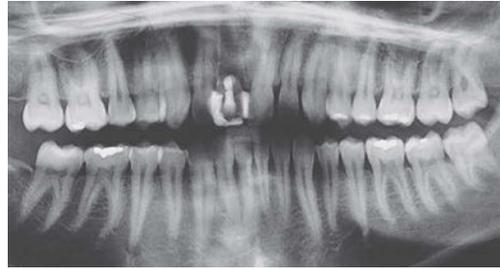
Since the patient presented with unsatisfactory bacterial plaque control, he was advised about oral hygiene techniques and subject to primary periodontal therapy.

Subsequently, clinical analysis was carried out, and impressions as well as dental casts were obtained for diagnostic wax-up.

Panoramic and periapical anterior-superior radiographs did not reveal any anomalies; thus, cone-beam computed tomography (CBCT) was requested (Figs. 2, 3, 4).



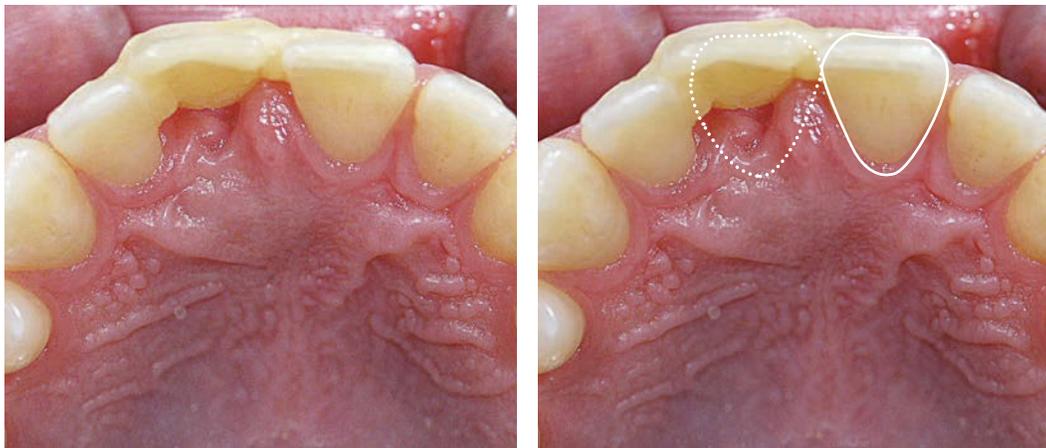
**Figure 1.** Patient primary conditions in frontal view.



**Figure 2.** Initial panoramic radiograph.



**Figure 3.** Patient without the temporary tooth, seven days after primary periodontal therapy onset.



**Figure 4.** Patient primary conditions in occlusal view.

## EVALUATION OF ESTHETIC RISK

The patient presented with good systemic health, no parafunctional habits and was nonsmoker. He had great expectations regarding esthetics; in addition to a high smile line, intermediate gingival biotype, absence of infection at the edentulous area, and absence of contact between neighboring teeth due to the presence of diastemata, which represents a major challenge for the neoformation of interdental papillae.

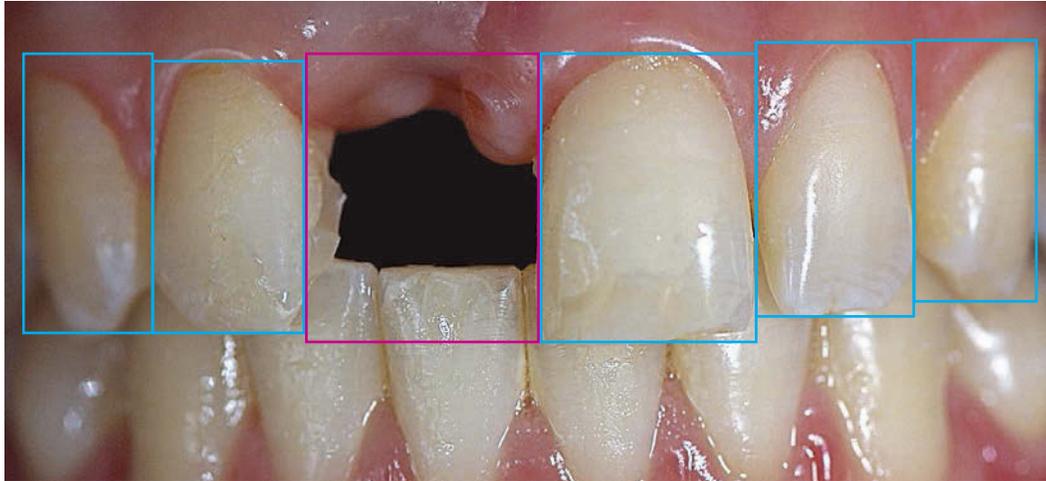
Neighboring teeth were intact and the missing tooth gap was slightly larger than the missing incisor width.

The patient did not agree on orthodontic therapy for space closure, although he was willing to solve his case by means of alternative therapy.

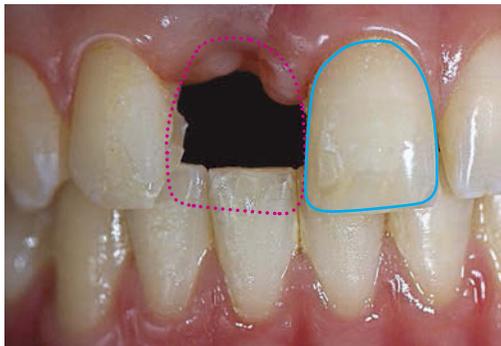
At the alveolar crest level, in the edentulous area, there was lack of soft tissue support and insufficient buccal bone volume (Table 1).

**Table 1.** Esthetic Risk Evaluation Table (ITI 2007).

Esthetic Risk Factor	Level of Risk		
	Low	Moderate	High
Medical status	Healthy, co-operative patient with an intact immune system	-	Reduced immune system
Smoking habit	Non-smoker	Light smoker. (<10 cigarettes / day)	Heavy smoker (> 10 cigarettes / day)
Patient's esthetic expectations	Low	Medium	High
Lip line	Low	Medium	High
Gingival biotype	Low scalloped, thick	Medium scalloped, medium thick	High scalloped, thin
Shape of tooth crowns	Rectangular	-	Triangular
Infection at implant site	None	Chronic	Acute
Bone level at adjacent teeth	≤ 5 mm to contact point	5.5 to 6.5 mm to contact point	≥ 7 mm to contact point
Restorative status of neighboring teeth	Virgin	-	Restored
Width of edentulous span	1 tooth (≥ 7 mm)	1 tooth (< 7 mm)	2 teeth or more
Soft tissue anatomy	Intact soft tissue	-	Soft tissue defects
Bone anatomy of alveolar crest	Alveolar crest without bone deficiency	Horizontal bone deficiency	Vertical bone deficiency



**Figure 5.** Delimitation of areas and proportions of teeth and missing tooth gap.



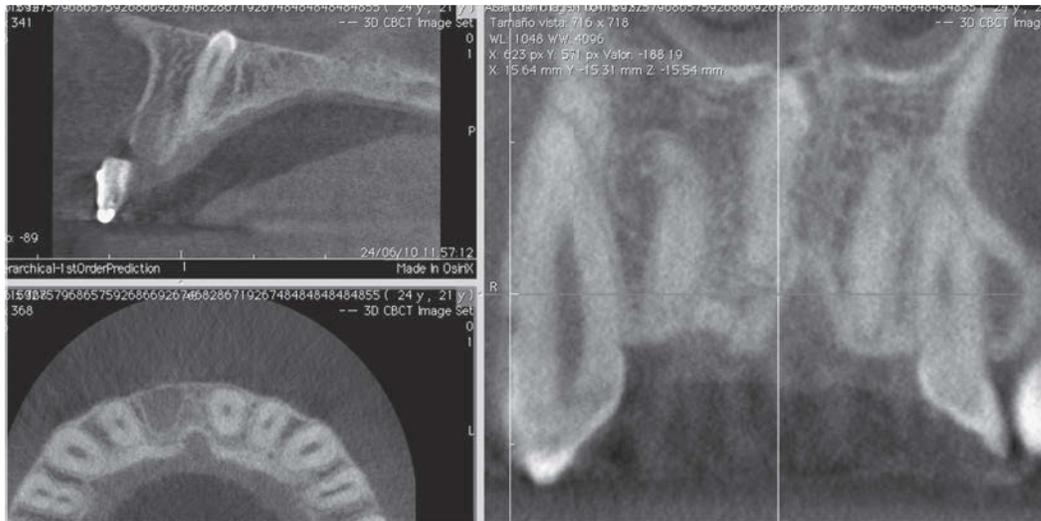
**Figure 6.** Edentulous space slightly larger than the counterpart tooth.



**Figure 7.** Prosthetic replacement virtual planning before diastema correction.



**Figure 8.** Diagnostic wax-up with which diastema closure was planned.

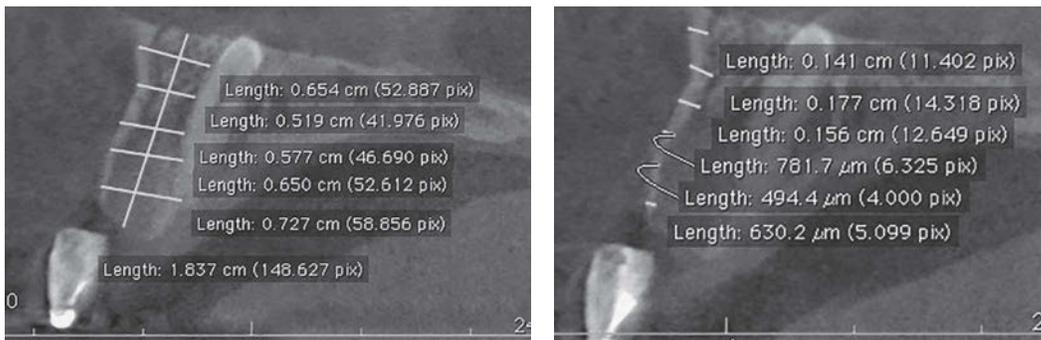


**Figure 9.** CBCT revealing impacted supernumerary tooth in inverted position at the nasal cavity floor, palatally to the socket of the missing tooth, near implant placement site.

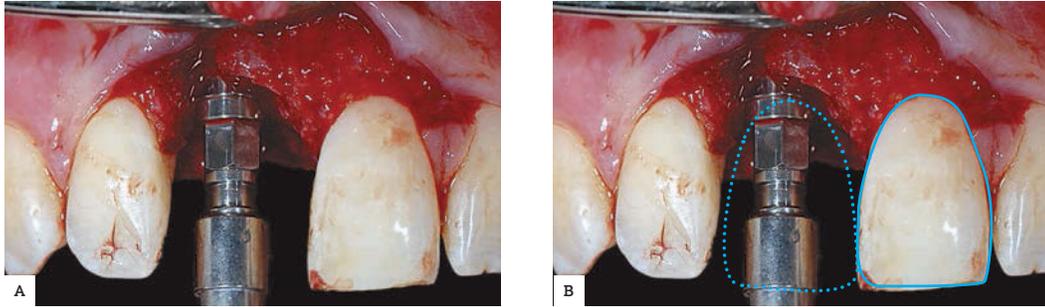
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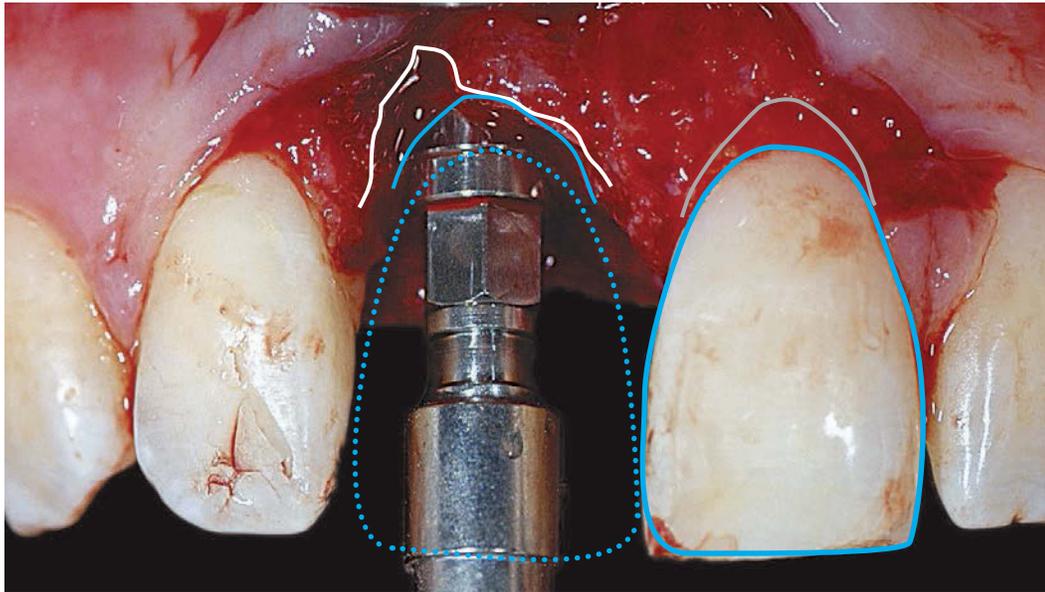
**Figure 10.** Position of impacted supernumerary tooth revealed by CBCT: after imaging diagnosis was made and the literature was reviewed, the option of extracting the impacted supernumerary tooth was refused due to the high potential risk involved in this procedure. An implant was then placed by means of an alternative, unconventional technique.



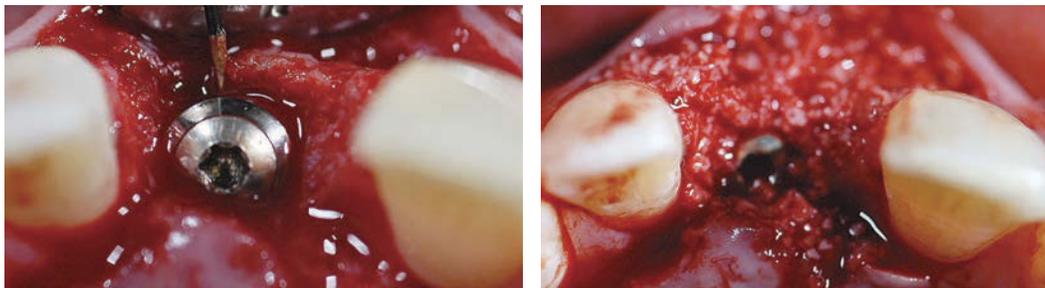
**Figure 11.** Bone volume available revealed by CBCT: there is lack of bone thickness at the implant placement site from which the impacted tooth was too near.



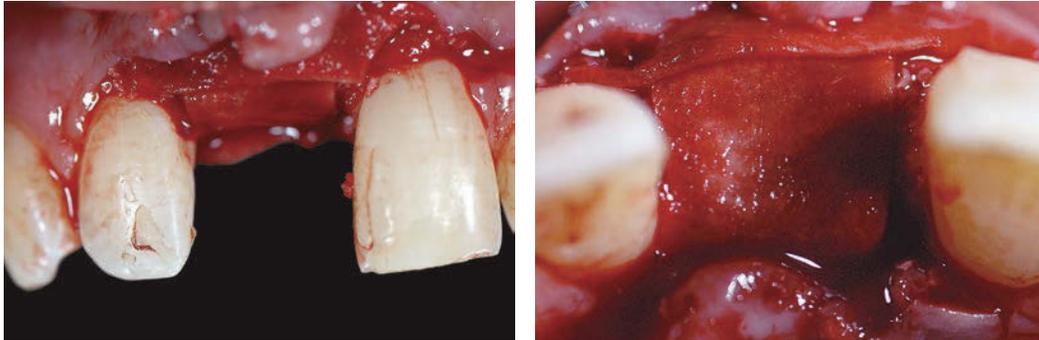
**Figure 12.** A) Straumann™ implant in place. B) Virtual planning of prosthesis.



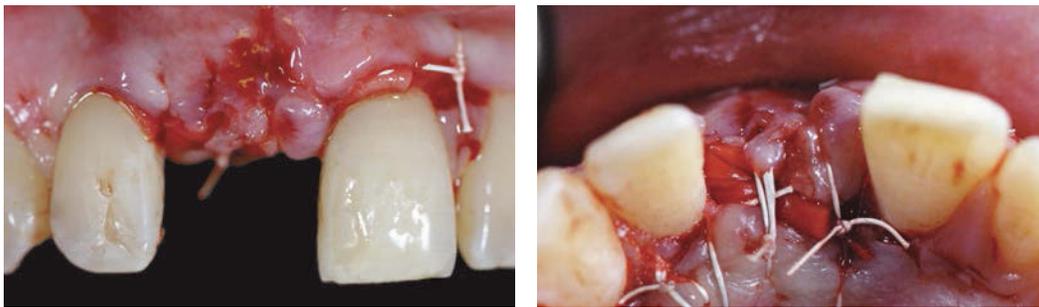
**Figure 13.** Straumann™ implant, planning of bone level of teeth #21 and 11 where there is lack of buccal bone volume, with severe distal defect, long distance between alveolar bone crests, and contact, which hinders interdental papillae neoformation success.



**Figure 14.** Occlusal implant view and resorbable hydroxyapatite placement under replacement speed (Bio-Oss™, Geistlich).



**Figure 15.** Frontal and occlusal view of Bio-Gide™ (Geistlich) resorbable double-layer membrane covering the resorbable hydroxyapatite.



**Figure 16.** Frontal and occlusal view of tensionless suture with GoreTex™ monofilament. Bio-Gide™ (Geistlich) collagenous membrane slightly palatally exposed.



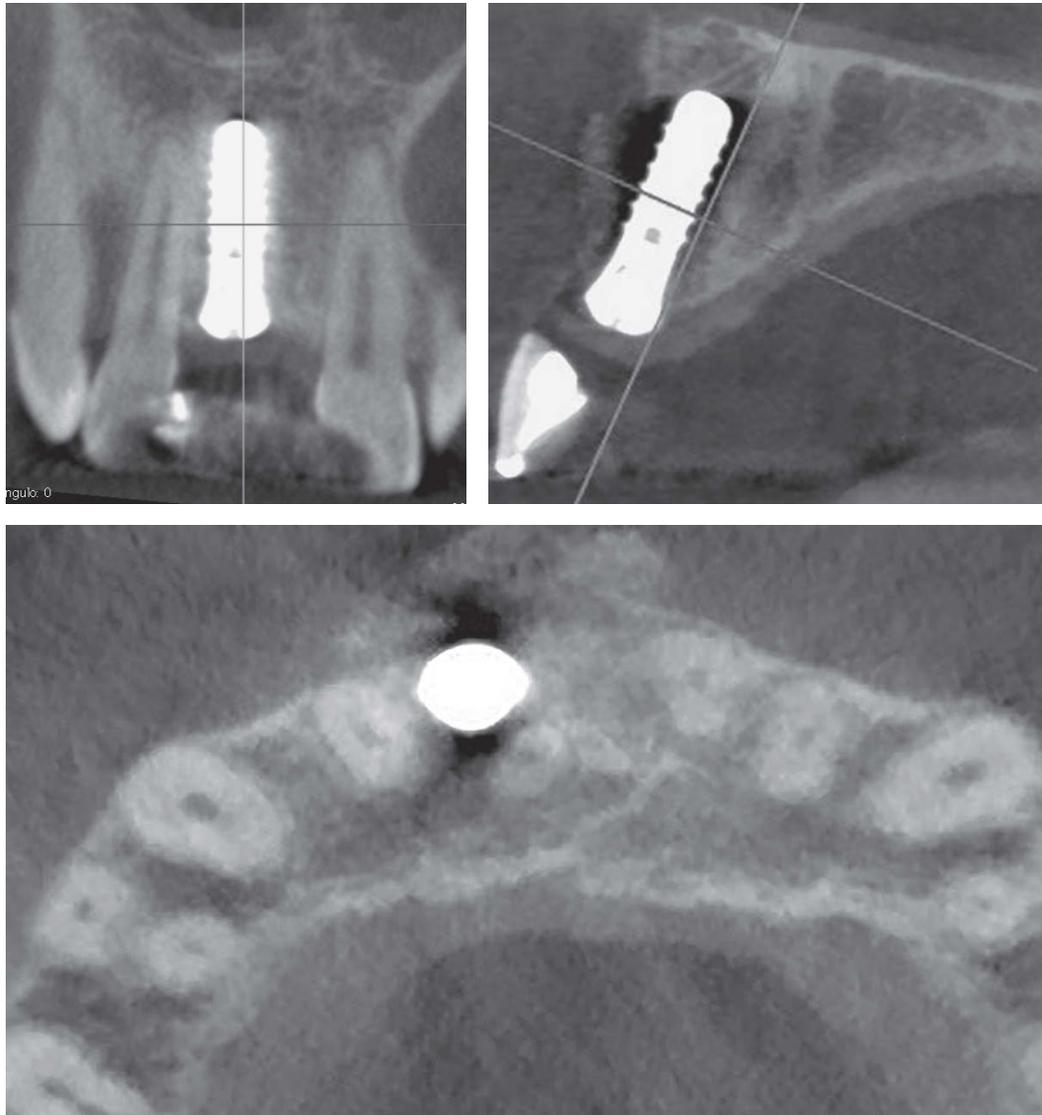
**Figure 17.** Radiograph immediately after surgery.



**Figure 18.** Frontal and occlusal view 21 days after surgery.

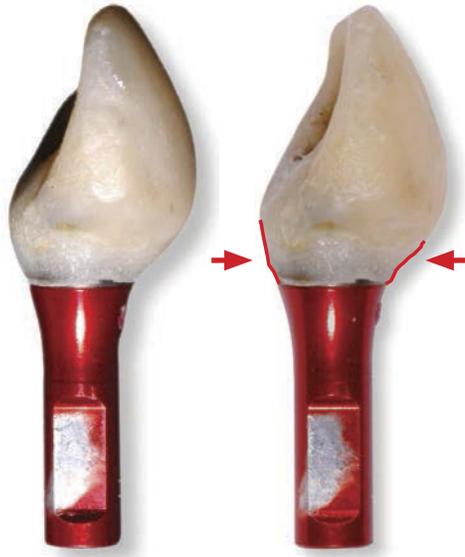


**Figure 19.** Frontal and occlusal view 40 days after surgery.



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**Figure 20.** Postoperative CBCT revealing no contact between the implant and the impacted supernumerary tooth.



**Figure 21.** Implant loading 90 days after surgery. Delimitation of provisional prosthesis transmucosal profile area screwed over its analogue, so as to create an emergence profile.

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**Figure 22.** Peri-implant soft tissue management, 90 days after surgery, using the compression technique by means of a provisional crown. Proximal prosthesis were made of composite resin for neighboring teeth.

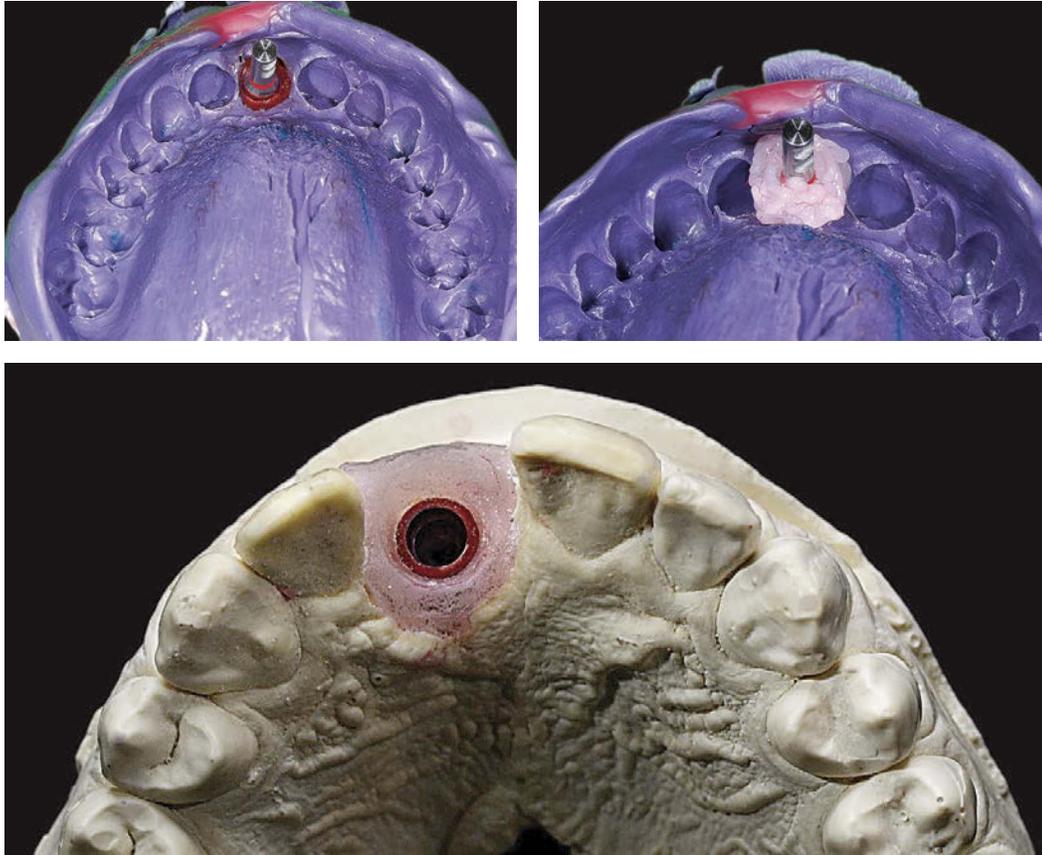


**Figure 23.** Impression coping customization for correct transposition of soft tissues to the dental cast.

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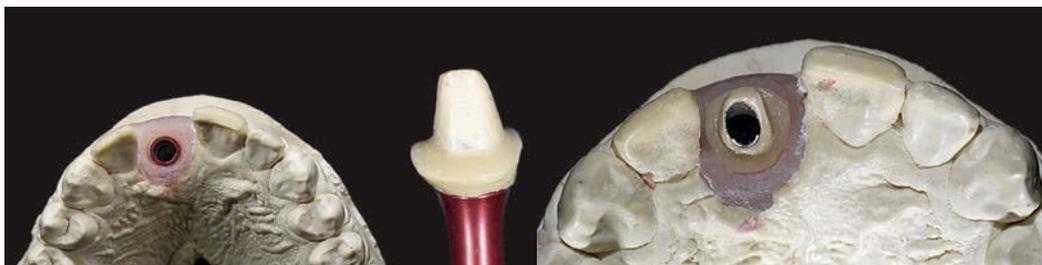


**Figure 24.** Impression coping placement for impression taking.



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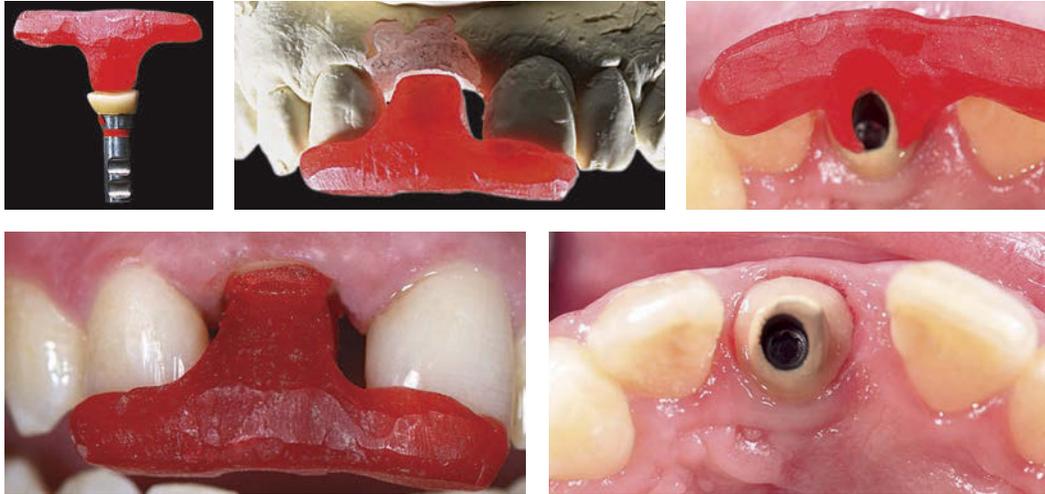
**Figure 25.** Impression taking and dental cast manufacture with reproduction of peri-implant soft tissues with the aid of an elastometer.



**Figure 26.** Dental cast and customized temporary metal-ceramic tooth used to enhance the emergence profile.



**Figure 27.** Customized temporary metal-ceramic tooth with Ivocron™ (Ivoclar) resin provisional prosthesis.



**Figure 28.** Acrylic resin transfer coping used to clinically place the temporary metal-ceramic tooth.



**Figure 29.** **A)** Diagnostic wax-up where interproximal space closure is planned. **B)** Virtual planning of clinically placed tooth. **C)** Cast and clinical reality superimposition with the temporary tooth in place.

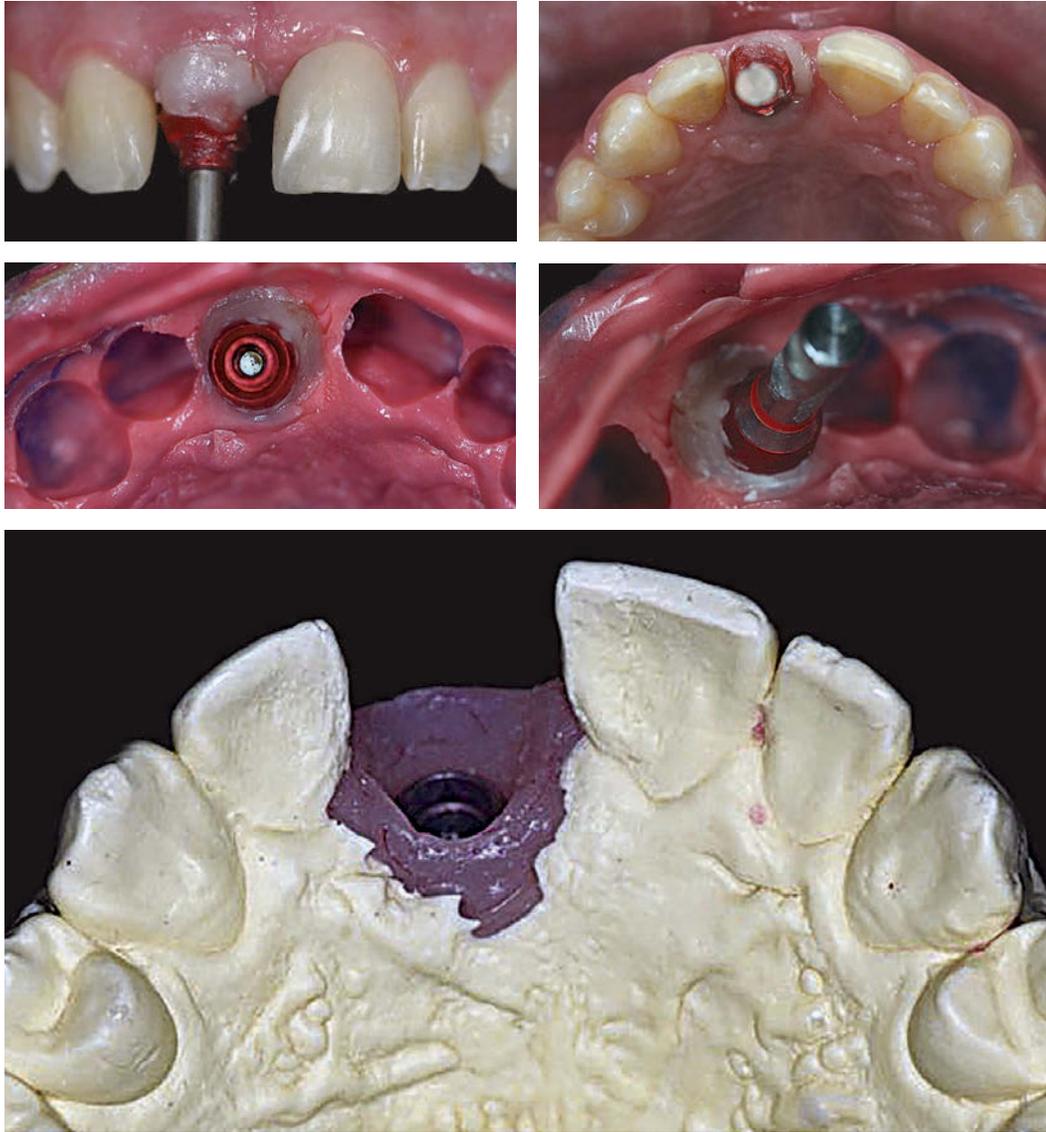


**Figure 30.** Resin provisional prosthesis cemented to the customized temporary metal-ceramic tooth.

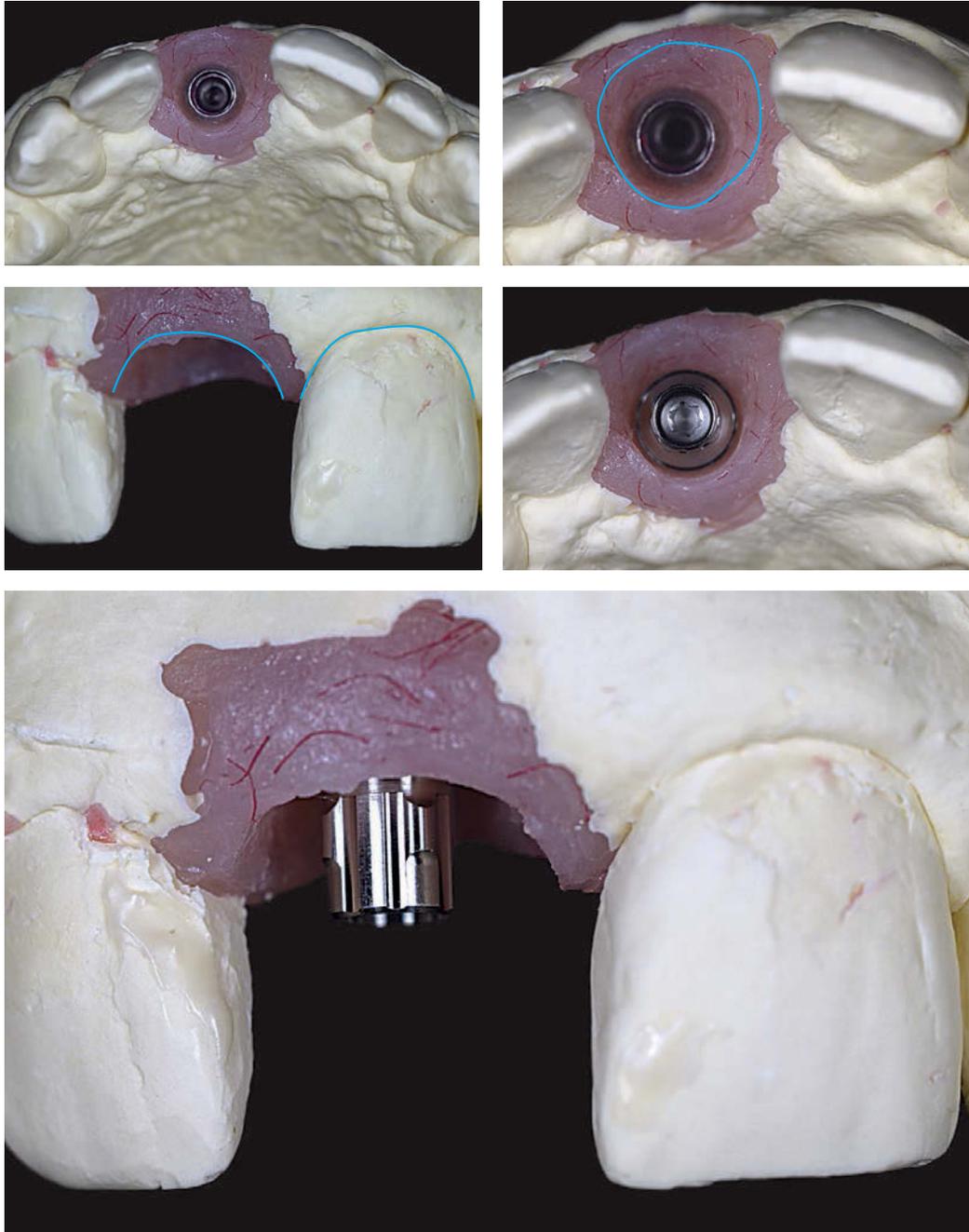
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**Figure 31.** Emergence profile obtained with temporary resin prosthesis 60 days later.

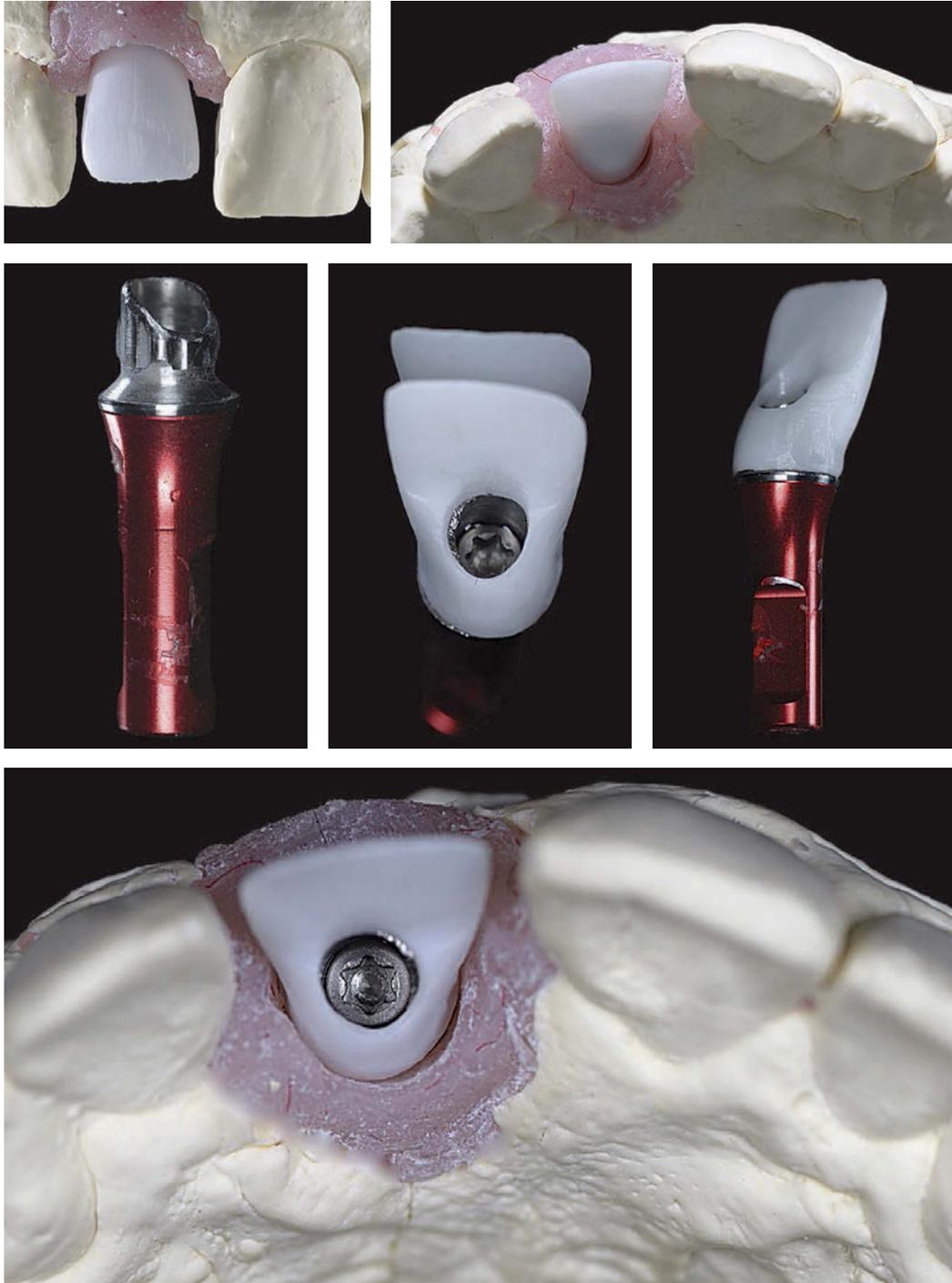


**Figure 32.** New impression with customized tooth and permanent dental cast with soft tissues reproduced in elastometer.

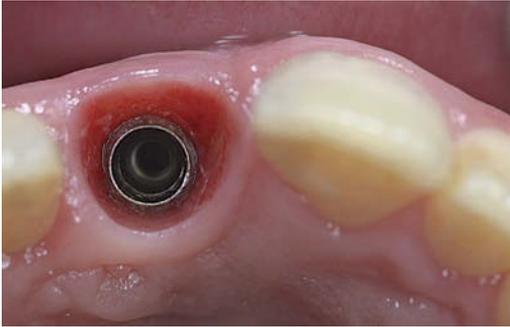


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**Figure 33.** Straumann Cares Variobase™ abutment placed into the dental cast.



**Figure 34.** Zirconia crown made with the aid of the CAD-CAM system, placed over Straumann Cares Variobase™ abutment.



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**Figure 35.** Provisional prosthesis: after prosthesis removal. Note soft tissues morphology with a provisional crown.



**Figure 36.** Clinical occlusal and frontal views of Straumann Cares Variobase™ abutment.



**Figure 37.** Clinical ceramic emergence profile trial.



**Figure 38.** Clinical ceramic dentin trial, with inner effects and enamel contouring.

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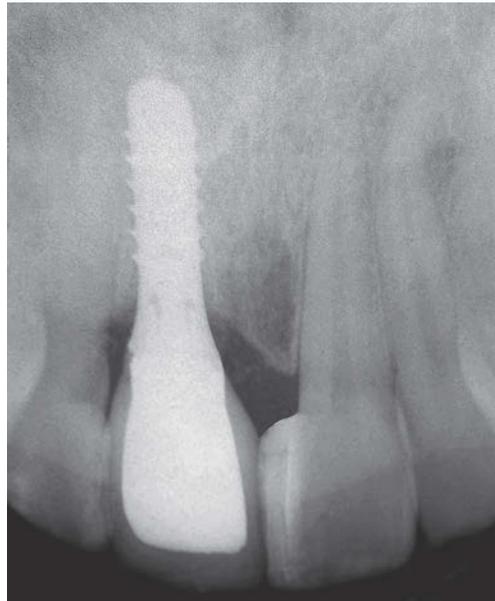
**Figure 39.** Potential ceramic corrections are virtually determined (in red, potential removals; in yellow, additions).



**Figure 40.** After being glazed, the prosthesis is cemented to the Straumann Cares Variobase™ abutment.



**Figure 41.** Permanent ceramic prosthesis being screwed at 35 Ncm<sup>2</sup>.



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**Figure 42.** Ceramic prosthesis and periapical radiograph three years after treatment completion (laboratory and ceramic work performed by Dr. Hugo A. Albera).

## DISCUSSION

Implant-supported prosthetic replacement must fulfill functional as well as esthetic requirements, especially when replacing anterior teeth.

Prosthetic replacement stable results rely on a number of factors, for instance: the quality of keratinized mucosa as well as buccal and interproximal bone height and width, adequate surgical approach, tridimensional position of implants, the type of material used, and the features of transmucosal prosthetic profiles.<sup>16-19</sup>

Provisional as well as permanent prosthesis transmucosal profile must be concave, since this design is what best preserves and maintains tissue stability over time, in addition to providing more space for surrounding connective tissues, thereby creating a ring-like morphology that acts as a barrier at the bone-implant interface.<sup>19,20,21</sup>

Another imperative requirement is that the transmucosal profile surface be smooth and highly polished, so as to prevent bacterial plaque formation and allow hygiene, which enhances healing and maturation of peri-implant tissues.

On the other hand, there are cases in which the goal is to avoid invasive tech-

niques; thus, non conventional treatment protocols are rendered necessary. This is the case of impacted teeth, as reported herein.

The literature presents several case reports<sup>22,23</sup> in which implants cross over impacted teeth, with high success rates similar to those achieved by conventional techniques.

In spite of the clinical cases reported in the literature,<sup>8</sup> evidence is insufficient to consider this therapy as a consolidated treatment. Thus, the clinician's decision about using or not unconventional techniques relies on potential risks and expected benefits.

## CONCLUSION

In order to achieve successful stable prosthetic rehabilitation outcomes in esthetic zones, accurate diagnosis, adequate treatment planning, proper material and predictable surgical as well as prosthetic techniques are paramount.

Team work is imperative as from the very beginning, with an intimate interaction among clinicians, laboratory technicians and patient, all of which must follow strict protocols with a view to determining and achieving the desired result.

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