



Malpositioned implants in the anterior maxilla: a novel restorative approach to reestablish peri-implant tissue health and acceptable esthetics. Part II: Case report and discussion

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Abstract

This two-part case presentation describes the prosthetic challenge of managing complications in a 50-year-old female patient after inadequate esthetic risk assessment, treatment planning, and implant placement in the anterior maxilla. In Part I, the clinical situation was described, and different restorative solutions were proposed to correct the extreme facial inclination of the implants, excluding major surgical procedures, namely implant removal. In

Part II, different prosthetic options are discussed, and the final treatment is revealed. A noninvasive treatment protocol was applied to transform a severely compromised postsurgical situation into an esthetically acceptable result. An unconventional prosthesis design was implemented, including the use of ceramic veneers bonded to the CAD/CAM-generated screw-retained zirconia-based fixed dental prosthesis (FDP), to correct major axis-related problems and spatial discrepancies.

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Introduction

The success of implant-supported fixed restorations in the esthetic zone depends on a multitude of factors that determine the long-term outcome of the executed treatment. The proceedings of the third ITI consensus conference (2004)¹ clearly defined these guidelines, with special emphasis on the comfort zones for correct implant positioning during placement, and well-defined criteria regarding the importance of proper patient selection and management of hard/soft tissue parameters. To provide a predictable esthetic result, an implant placed in the esthetic zone needs to be positioned in a three-dimensional (3D) spatial relationship that is in harmony with its surrounding structures. Currently, diagnostic procedures and structured risk assessment often comprise custom-designed templates combined with cone beam computed tomography (CBCT) to assess local bone anatomy.² If an experienced clinician plans to follow an immediate placement approach, these are key tools in the selection process of optimal implant design and dimension, as well as in the detailed planning of implant positioning.

The esthetic outcome of the present case failed mainly due to an inappropriate case selection and the incorrect execution of an immediate implant placement approach. The case was subsequently treated according to the best possible option relative to the existing clinical situation, taking into consideration all the outcome parameters involved, as well as the patient's desire for a conservative treatment modality. Recent *in vitro* studies³⁻⁴ and a case re-

port⁵ have shown promising perspectives involving new esthetic solutions for space-constrained clinical situations similar to the one being described in this article.

Case presentation

A 50-year-old Caucasian female patient presented to the Department of Fixed Prosthodontics and Biomaterials with an implant-supported provisional fixed prosthesis in the anterior maxilla that had failed in its esthetic outcome (Figs 1a and 1b). The treatment history revealed extraction of both maxillary central incisors, followed by immediate implant placement and restoration with a cemented provisional. The patient expressed a strong desire for a permanent solution with a notable improvement of the esthetic dimension. Intraoral examination showed an extreme facial inclination of implants 11 and 21, and the presence of severe chronic peri-implant mucosal inflammation.

Furthermore, the intraoral and radiological examination revealed an endodontically compromised maxillary left lateral incisor (Fig 2) exhibiting deep pockets, and tenderness to percussion and palpation. There were no significant findings in the medical history.

The patient insisted on a conservative treatment option to avoid major surgical procedures, which might have included implant removal and reimplantation, in conjunction with hard and soft tissue grafting.

Based on the patient's desires and the existing clinical situation, the treatment objectives outlined for this case



Figs 1a and 1b Patient presented with a provisional FDP, cemented on two implants in positions 11 and 21. The patient's high smile line, the thin facial mucosa, and the presence of scars relating to multiple previous surgeries represented a particular challenge for the restorative clinician. Note the poor marginal adaptation of the prosthesis.

included the elimination of any existing local inflammation and the reestablishment of adequate oral hygiene, followed by the insertion of a definitive implant-supported fixed dental prosthesis (FDP) correcting the facial inclination of the implants. Further aspects considered in the planning related to the patient's high smile line and the thin gingival biotype.

Hence, various treatment alternatives were discussed and, finally, a viable conservative option was executed which best fulfilled the various criteria.

Decision process

Debates on the choice of the ideal prosthetic superstructure for this case included: straight vs angulated vs custom abutments, metal-ceramic vs all-ceramic FDP, screw-retained vs cemented, and freestanding vs splinted crowns.

The standard straight abutment or the prefabricated angulated abutment definitely would not have sufficed in this case due to the extreme facial positioning and

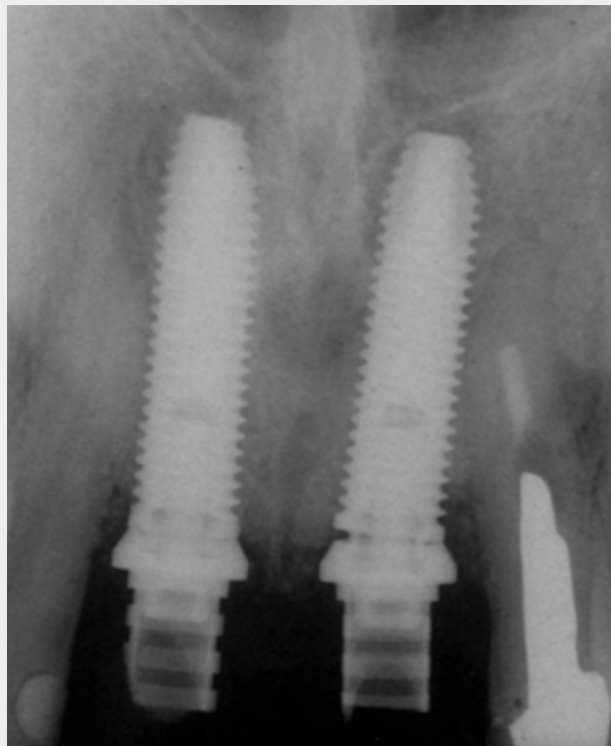


Fig 2 Periapical radiograph illustrating the incorrect seating of the abutment of the provisional prosthesis at the level of implant 21. In addition, the left lateral incisor exhibited a large post and an incomplete root canal filling. Periapical radiolucency was also noticeable. The patient reported pain at the level of this tooth, and the presence of a root fissure was suspected.



Fig 3 A new screw-retained provisional was delivered to the patient. Due to the problematic implant position, the access to the screws on the facial aspect of the central incisors was closed with direct composite restorations. Artificial gingiva was an integral part of this interim prosthesis to compensate for the vertical tissue deficiency; namely, in between the two implants, and at the site of the previously extracted left lateral incisor.

labial inclination of the implants. When laboratory procedures were discussed, this facial inclination also excluded the use of a screw-retained prosthesis over two multiunit abutments. This restricted the choice to custom abutments, where the axial alignment could be satisfactorily corrected, thus providing sufficient space for the ceramic layering.

The spatial constraint excluded the use of porcelain fused to metal (PFM) restorations. In fact, the PFM option might have been compromised in terms of the long-term esthetic outcome by the metal showing through the thin, soft tissue in the cervical area following recession. The patient's high esthetic demands also favored the selection of an all-ceramic FDP. The use of pink ceramics was indicated in this case due to a substantial loss of soft tissue and the resulting difference in coronoapical levels.⁶ To avoid excessive crown height and respective altered relative tooth dimensions, a more harmonious appearance could be achieved using pink ceramics.

Screw retention of an implant-supported prosthesis in the anterior maxilla has several advantages over cement retention as it allows retrieval of the restorations, when indicated.⁷ If a cemented restoration is selected, it is essential to carefully and completely remove any excess cement around the implant. This is critical for deep submucosal margins.⁸⁻⁹ In this context, a positive relationship between excess cement and peri-implant disease has been documented.¹⁰ Considering treatment access in case of eventual biological and technical complications, and the apparently superior biocompatibility, a recent systematic review concluded that screw-retained reconstructions seem to be preferable.¹¹

A cement-retained restoration was not used in this case also because of the extreme orofacial angulation of the implants that would have positioned the final FDP further facially. The minimal thickness required for a cemented restoration was not achievable in this clinical situation, and hence the long-term structural durability of the restoration



would have been compromised. Esthetic considerations required a better spatial distribution between white and pink ceramics, and therefore a screw-retained splinted “hybrid” design, including a cantilevered ovate pontic, was chosen to allow for the efficient correction of the problem. All of the above elements required the splinting of the two implants.

Due to the facial positioning of the implants, the screw access channels were located on the facial surface of the crowns, compromising the esthetic appearance. A possible option to mask these channels would have been to either use light-polymerizing restorative composite resin or bonded ceramic inlays. To exactly match the shade between ceramics and composite is always challenging, with the additional inevitable risk of color changes over time. Clearly, the interface between composite and ceramics will gradually become more obvious. Therefore, ceramic veneers were fabricated and bonded onto the screw-retained infrastructure. This alternative successfully rendered the facial screw access channels invisible, and achieved a harmonious facial alignment. Even though the lack of retrievability of the FDP (due to damaging the veneers) represents a disadvantage, a minimally invasive access to the screw access channels is still possible, transforming the prosthesis into a repairable, screw-retained restoration.

This particular clinical situation restricted the use of standard prosthodontic protocols and led to the somewhat unconventional design described above, utilizing different facets of the prosthodontic armamentarium to achieve an optimal result.



Fig 4 The extraction of the lateral incisor, considered irrational to treat, led to both a horizontal and a vertical crestal deficiency. The question was whether a soft tissue graft should have been performed at the time of the extraction.

It is noteworthy that the choice of materials and the overall superstructure design employed in this case were primarily justified by the esthetic considerations associated with the initial clinical situation. Underlining this case presentation is the fundamental importance of optimally performing a preoperative diagnosis and subsequent implant surgery. The correction of esthetic implant failures consistently leads to compromised results when compared to what could have been possible if *“the thing had been done right the first time round”*.

Treatment sequence

Following extraction of tooth 22, a directly screw-retained 3-unit implant-supported fixed provisional was placed for a period of 9 months to allow complete soft tissue healing and maturation (Figs 3 to 5). Considering the presence of severe chronic peri-implant mucosal inflammation (particles of bone grafting

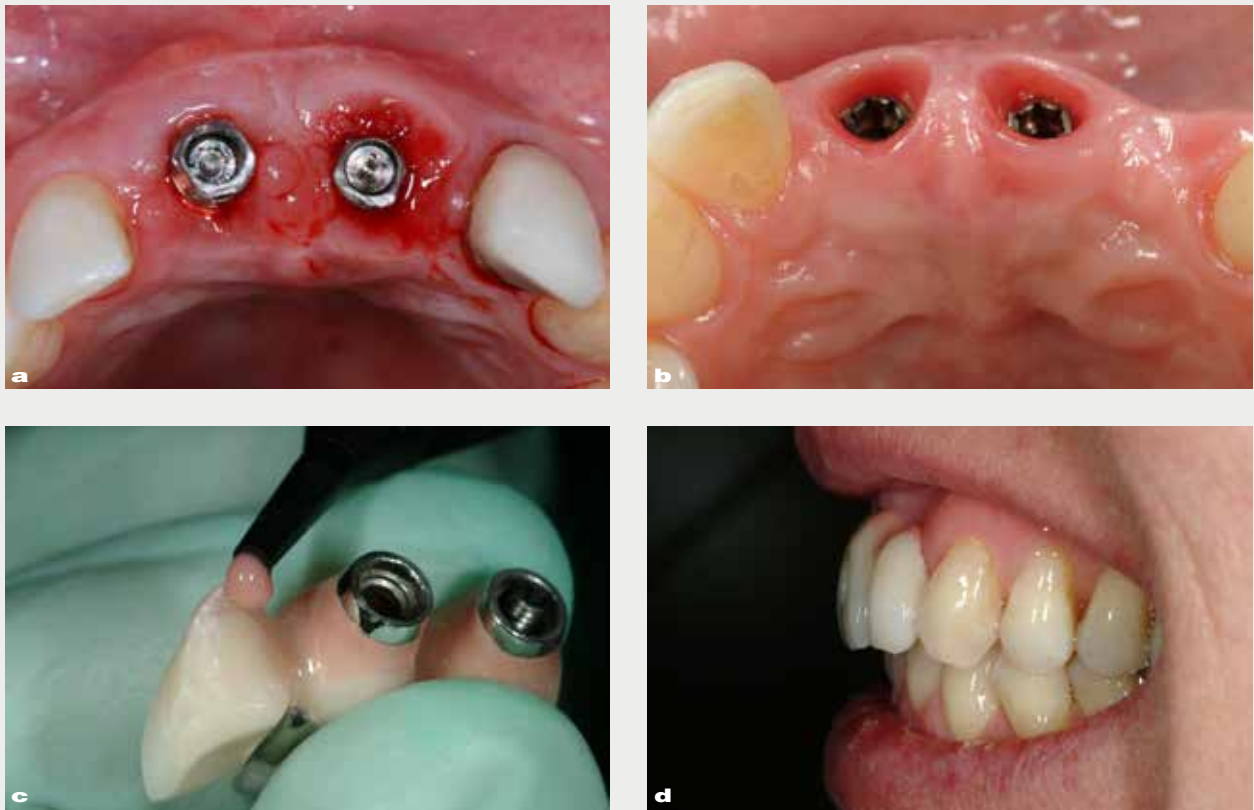


Fig 5 (a) initial status and (b) before final impression. Improved soft tissue morphology was obtained during the provisional phase before the final impression. The defect at the level of the left lateral incisor site was compensated for with the use of pink flowable composite (Sinfony, 3M ESPE), added chairside (c). In the profile photo of the patient's forced smile (d), the postextraction deficiency becomes evident. Fortunately, the area was not completely exposed during the patient's normal smile.



Figs 6a and 6b Final impression. A customized pink shade guide was used to select the color of the artificial gingiva in view of the final prosthesis.



material detaching), and periapical infection on root 22, the opportunity to proceed with bone/soft tissue preservation was debated. However, as previously mentioned, the patient confirmed that she was opposed to this.

Once adequate soft tissue contours were obtained, the definitive restorative phase was initiated (Fig 6).

A vinyl polysiloxane (Express, 3M ESPE) impression was taken, and a custom-milled screw-retained zirconia infrastructure (ICE Zirkon, Zirkonzhan) was fabricated. This framework was built up and veneered (HeraCeram Zirkonia, Heraeus Kulzer), featuring screw access channels on the labial surfaces, with a cantilevered ovate pontic in location 22. The restoration was tried in to assess and optimize clinically the inclinations and final contours, including pink and white esthetic parameters. The labial surfaces of teeth 11 and 21 were further prepared in the laboratory in view of ceramic veneers (HeraCeram; Figs 7 and 8).



Fig 7 The final restoration was composed of a 3-unit screw-retained zirconia framework, featuring a superficial layer of feldspathic ceramic, as well as integrated artificial gingiva at the cervical aspect, to be complemented by two labial feldspathic veneers to cover the screw access channels.

During the following clinical session, both the screw-retained base of the restoration and the veneers were tried in for fit and precision. The prepared surfaces of the base and the veneers were etched with 9% hydrofluoric acid (Porcelain Etch, Ultradent) for 90 s, thoroughly rinsed with water for 20 s, and cleansed



Figs 8a and 8b To achieve a cleanable emergence profile without compromising esthetics, a careful final reshaping of the contour of the artificial gingiva was performed chairside.



Figs 9a and 9b Before bonding the two facial veneers, the screw access channels were sealed using PTFE tape and composite restorative material.



Figs 10a and 10b Final restoration immediately after the bonding of the facial veneers. The periapical radiograph confirmed the adequate marginal fidelity of the prosthesis.

in an alcohol ultrasonic bath for 5 min. The intaglio surfaces were then silanated (Monobond-S Plus, Ivoclar Vivadent) and dried.

The abutment component was inserted and torqued to a recommended value of 35 Ncm. After sealing the screw access channels with PTFE tape,⁸ a single coat of adhesive resin (OptiBond FL Adhesive, Kerr) was applied in the ac-

cess channels and light polymerized, followed by the application of a light-curing restorative composite resin (Tetric EvoCeram, Ivoclar Vivadent; Fig 9).

The previously etched ceramic surfaces were then coated with adhesive resin (OptiBond FL Adhesive), and the veneers inserted using a preheated, light-polymerizing restorative composite resin (Tetric EvoCeram; Fig 10).



Fig 11 (a) initial status and **(b)** final result. The acceptable esthetic result is related to the upper lip position. Fortunately, the only visible parts of the artificial gingiva of the prosthesis are the papillae, while the junction between the artificial gingiva and the alveolar mucosa remains hidden by the upper lip.



Figs 12a and 12b Final left-lateral view. The patient was very pleased with the esthetic result, and also comfortable regarding the cleaning efforts that would be required, since the cervical profile was perfectly convex.

Thereafter, complete polymerization, finishing, and polishing procedures were carried out (Figs 11 and 12).

Summary

In conclusion, for cases of extreme implant malposition and with limited restorative space, this innovative combined prosthetic solution in the esthetic

zone is proposed. The present clinical situation restricted the use of conventional prosthodontic protocols and led to the design described in this article, utilizing different facets of prosthodontic options to achieve a satisfactory result. The choice of the materials and superstructures employed in this case was justified by the esthetic demands required by the initial clinical situation.



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