

Rehabilitation of the anterior maxillary area with immediate implant placement

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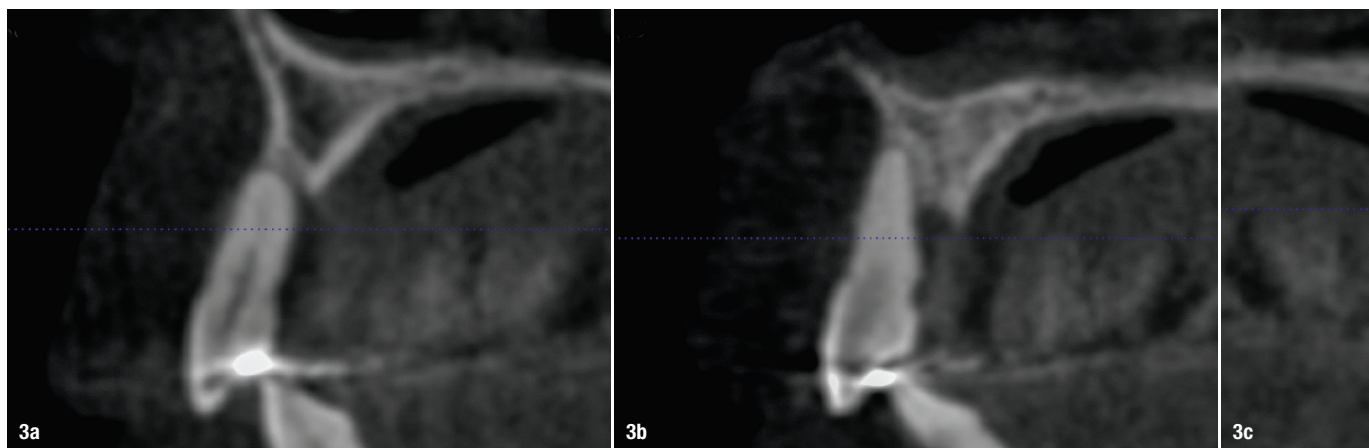


Figs. 1 & 2: Initial clinical situation.

Introduction

The alveolar process and other tissues of the periodontium are tooth-dependent anatomical elements;¹ in fact, tooth loss is followed by a cascade reaction of biological phenomena that cause progressive atrophy of both hard and soft periodontal tissue.² Such atrophy is characterised on one hand by a total loss of the attachment fibres of the root cementum, the periodontal ligament and the bundle bone and on the other hand by vertical and hori-

zontal volumetric alteration. It has been seen that the resorption of the alveolar ridge, with its consequent lingual repositioning, can reach 40–60%^{3–5} and that this phenomenon occurs on a maximum scale during the first three to six months after tooth extraction,^{1,5,6} but it also continues gradually throughout the whole life of the individual (about 0.5–1.0% every year).⁷ Specifically, during the first eight weeks, bone resorption occurs especially in the mid-buccal area, that is, the area anatomically further from the periodontal ligament of the adjacent teeth



Figs. 3a–d: Radiographic evaluation by means of CBCT.

(if any), which help maintain the interproximal bone.⁸

Furthermore, in a thin biotype, the defect generated will be a two-walled defect, owing to the more or less consistent loss of the vestibular cortical bone; whereas, it will be three-walled in a thick biotype, thanks to the greater thickness of the external cortical bone.⁸ Soft-tissue changes, however, mainly take place in the first two weeks after extraction; nevertheless, in the presence of a thin biotype, a significant thickening of the gingival volume is observed in the early stages, mainly due to the resorption of the vestibular bone and the formation of granulation tissue in the crestal portion of the alveolus.⁸ Knowledge and consideration of these changes and the clinical repercussions of a similar process of physiological atrophy are fundamental in order to simplify any future therapeutic procedure aimed at the replacement of missing teeth, as well as to optimise the functional and aesthetic result.

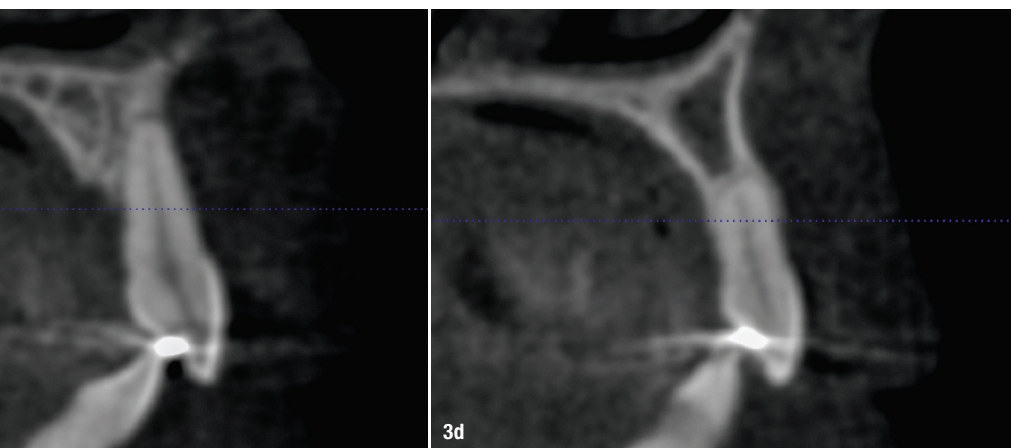
One of the current options for counteracting the post-extraction tissue remodelling phenomenon is alveolar preservation. There are several regenerative procedures, each with different therapeutic indications: preservation of soft tissue, of soft and hard tissue, and of hard tissue.⁷ Contemporary scientific literature highlights the fact that alveolar preservation, regardless of the technique and type of biomaterial used, allows more favourable results than those of spontaneous alveolar healing, considerably reducing the

volumetric atrophy of the bone crest.^{6,9} Nevertheless, its efficacy has been found to depend strictly on a large number of local and general factors, such as the inclination of the socket, the condition of the adjacent teeth, the periodontal biotype, the vestibular cortical bone, systemic factors and the habits of the patient; for example, an essential precondition for an alveolar preservation protocol is the integrity of at least three of the four alveolar walls and at least 80% of the non-intact wall.¹⁰

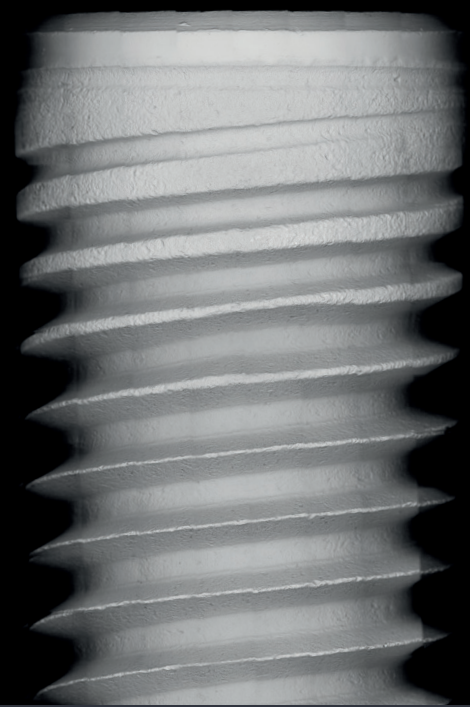
Another therapeutic option is immediate implant placement, which has the advantage of significantly reducing treatment time and achieving better tissue maintenance and, therefore, a better aesthetic result.¹¹ The psychological benefit and the high comfort that such a protocol can offer the patient should also be emphasised, especially if it is also associated with immediate occlusal loading. However, this technique is defined as straightforward, advanced and complex, since it requires adequate surgical experience and excellent evaluation by the surgeon in each of the different clinical situations where it can be applied.

Clinical case

We received in our private clinic a 33-year-old female patient who reported mobility regarding the maxillary incisors and some concern about their possible sudden loss (Figs. 1 & 2). A careful clinical analysis, a dental panoramic tomogram



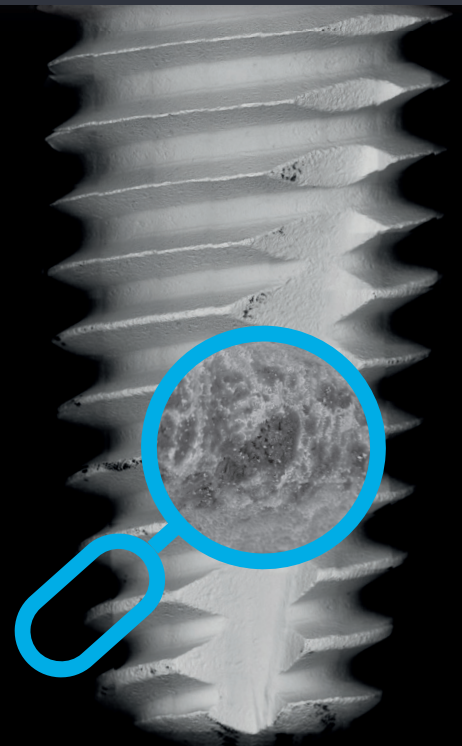
3d

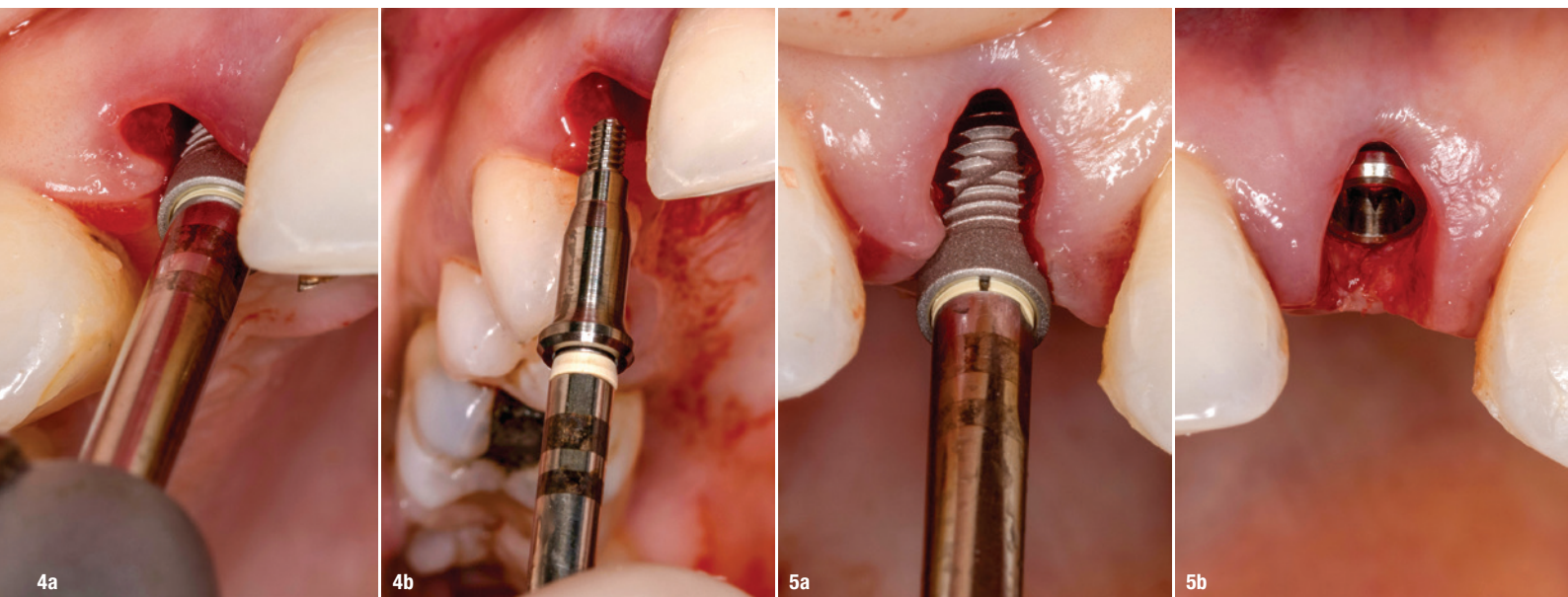


EXPECTATIONS

VS.

REALITY



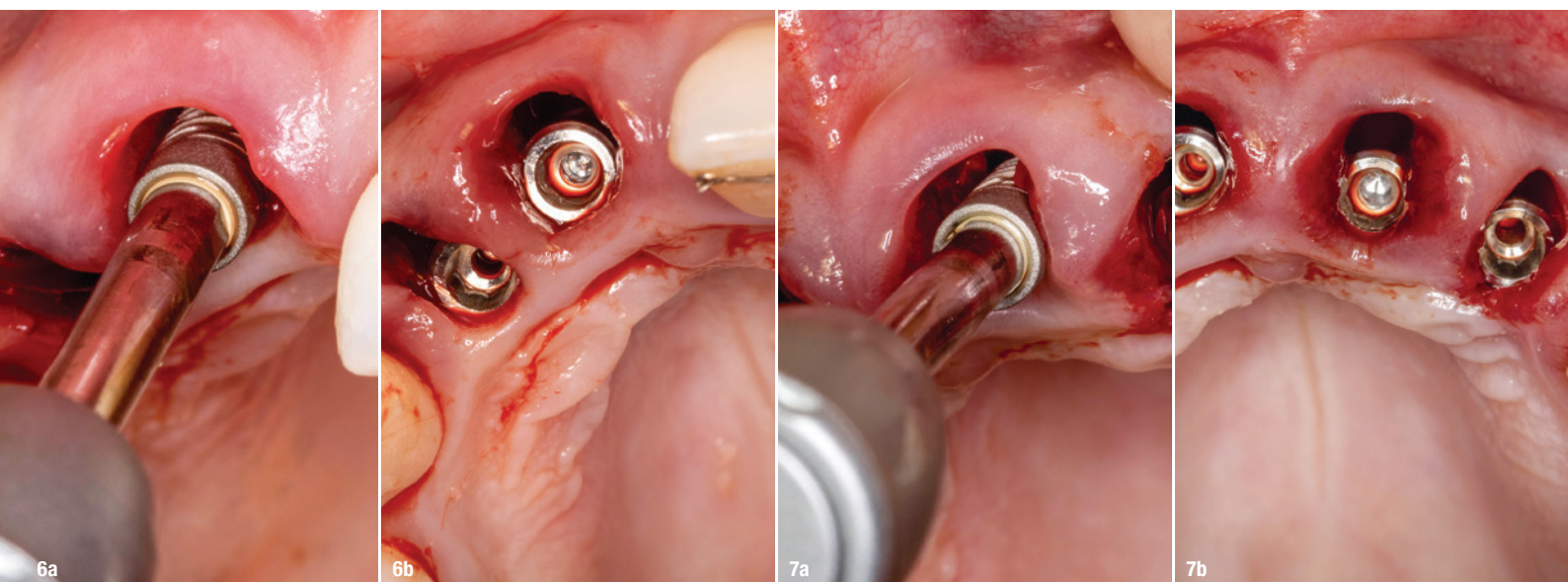


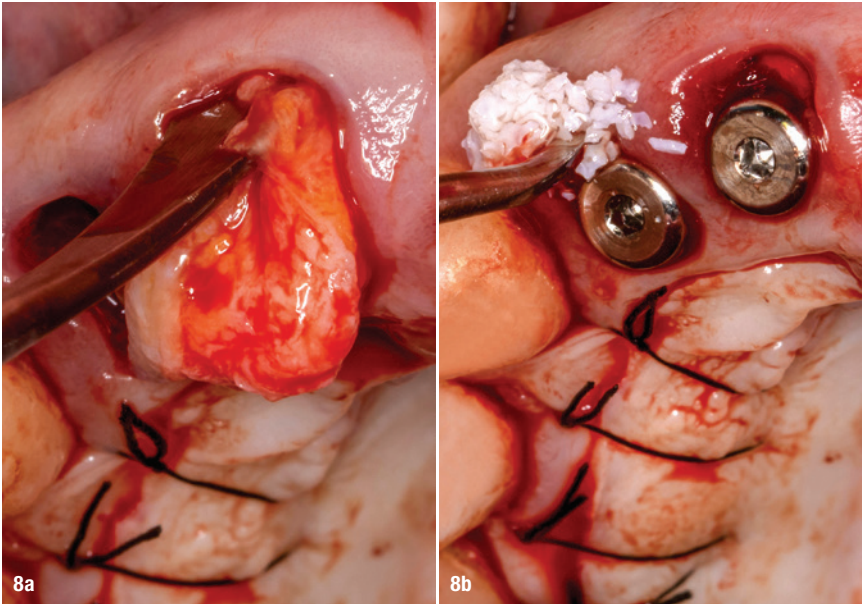
Figs. 4a–7b: Immediate implant placement.

and a cone beam computed tomography (CBCT) scan allowed us to observe the following clinical signs (Figs. 3a–d): Grade II mobility of teeth #12, 11, 21 and 22; marked gingival recession, the absence of papillae and a compromised periodontal situation in the same anterior maxillary area; and a periodontal lesion in the area of teeth #12 and 11 with destruction of the interproximal bony papilla. The treatment plan proposed to the patient was to extract the four teeth and replace them with four implants immediately placed and occlusally loaded and to simultaneously graft the hard and soft tissue.

The surgery began with the minimally invasive extraction of one of the teeth, followed by placement of the corresponding implant with a flapless technique in order to

retain the anatomical reference of the adjacent teeth. The same method was applied until the fourth implant had been inserted. All the implants placed were GTB TZERO implants of 3.6m × 9.0mm (Advan; Figs. 4a–7b). The GFA abutment for single crowns (Advan) was chosen as the prosthetic abutment (the reasons will be highlighted later). The height of the abutment was 5.5mm for the implants in the first quadrant and 6.5mm for the implants in the second quadrant. Posteriorly, subepithelial connective tissue was harvested from both sides of the palate, and multiple connective tissue grafts were placed using an envelope technique, placing only one suture for each graft. To finalise the surgery, we proceeded with socket filling with a particulate bone biomaterial (Geistlich Bio-Oss, Geistlich Biomaterials; Figs. 8a–10b). Impressions were



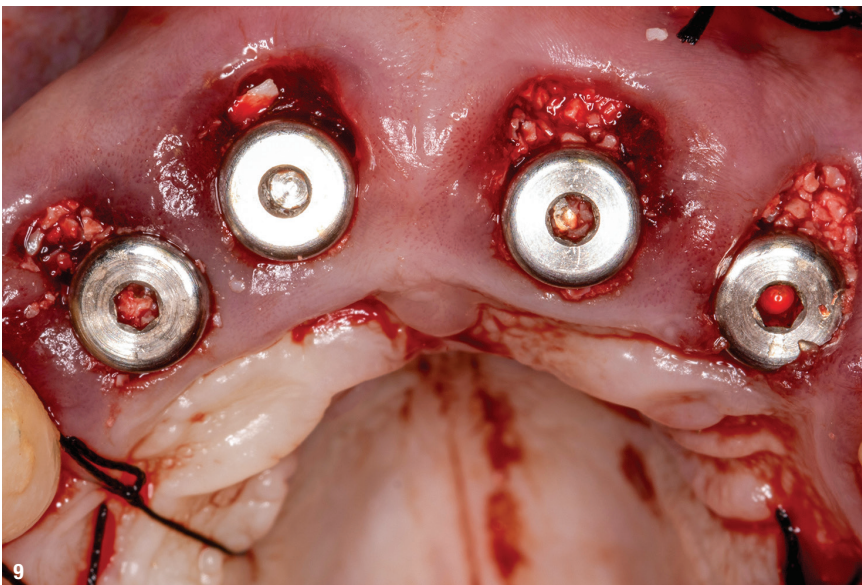


Figs. 8a–9: Bone augmentation around the implants.

taken immediately after the surgery in order to fabricate four provisional single crowns in resin and to place them on the same day of the surgery.

The patient was examined after one week for a check-up and for the removal of the sutures in the area of the connective tissue grafts. At one month and three months after the operation, a follow-up CBCT check was performed in order to check the conditions of the buccal bone. This was not a routine examination, but was carried out in this case given the delicacy of the patient's bone

conditions and the importance of maintaining the external cortical bone as support to the soft tissue and, therefore, as fundamental for a satisfactory aesthetic result. The tightening torque of the abutments and the effective osseointegration of the four implants were confirmed at this appointment too. The definitive impressions were taken with four customised impression copings using the open-tray technique in order to retain the gingival emergence profile. Subsequently, four new provisional crowns in polymethylmethacrylate were designed using CAD/CAM to redefine in detail the



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Figs. 10a & b: Situation after implant surgery.

emergence profiles and the dental anatomy before copying the latter in zirconia, the material in which the definitive crowns were to be made (with the vestibular addition of layered ceramic). Both the bone and the emergence profile were acceptable and made it possible to obtain, in association with careful and personalised prosthetic work, a functional and aesthetic result that was satisfactory for the patient.

“Immediate implant placement is a technique that has undergone great evolution in recent years...”

Discussion

Immediate implant placement is a technique that has undergone great evolution in recent years; in fact, many of the conditions once considered contra-indications (such as active infection and lack of integrity of the external cortical bone, especially if associated with a thin periodontal biotype) today constitute a clinical situation in which this technique is predictable if used with some complementary protocols. As demonstrated by the most recent scientific literature, the survival rate of immediately placed and occlusally loaded implants is now comparable to that of immediately placed implants restored according to the conventional loading protocol, but some key funda-

mental factors for the aesthetic and functional therapeutic success of immediately placed and occlusally loaded implants do exist.

Firstly, the 3D palatal positioning of the implant is a key element for the preservation of the buccal bone and for the reduction of the risk of bone dehiscence and gingival recession.⁴ Indeed, vestibular placement is associated with a greater resorption of the external cortical bone.¹² Secondly, the gap generated between the implant surface and the buccal bone should ideally be at least 2 mm, in order to be able to leave adequate 3D space for socket filling and the formation of a good blood clot; in fact, recent studies show a negative correlation between a greater gap and the amount of vertical bone resorption.¹³ Thirdly, it is well established that the use of immediately loaded provisional crowns is crucial for the stability of the buccal gingival margin,^{11,14,15} for the protection of the surgical wound, clot and bone graft,¹² for soft-tissue support and for the creation or maintenance of aesthetic papillae.¹¹ Furthermore, the same result in terms of soft-tissue stability would be achieved regardless of the biotype.¹¹ Finally, it has been observed that non-immediate provisionalisation is associated with greater bone remodelling.¹⁶

Fourthly, the flapless technique, associated with minimally invasive extraction, is another key factor for the success of immediately placed and occlusally loaded implants, mainly because it avoids any interruption of vascularisation, something crucial for the tissue regeneration potential. In fact, recent studies recommend the use of a flapless protocol whenever possible to minimise marginal remodelling;¹⁶ nevertheless, there are clinical situations in which raising a surgical flap is indispensable and prudent, especially in the presence of major bone defects or very unfavourable alveolar conditions. Fifthly, it has been suggested that, in association with the correct 3D placement of the implant, the connective tissue graft is an important factor for volumetric augmentation and soft-tissue maintenance, thus avoiding gingival recession and important aesthetic problems.¹⁷ Moreover, it would also be able to provide adequate support to the underlying bone, thus contributing to its stability.¹⁸ Sixthly, the choice of prosthetic components is a key element for tissue maintenance. Both the one abutment, one time protocol and the use of platform shifting favourably affect the stability of the tissue, as the use of abutments with narrower diameters than those of the implant platforms is essential to reduce marginal bone loss^{11,19–21} and, in the presence of a thin biotype, to ensure sufficient biological width.¹¹

In the case described, the therapeutic strategy regarding the number of implants and the type of prosthetic connection and restoration proved to be essential for obtaining the final result. Specifically, the placement of four implants

(for four crowns) was motivated by the need to minimise tissue atrophy and optimise the volume throughout the anterior maxillary area. The GTB TZERO implant, thanks to the morphology of the threads in the apical portion, is particularly suitable for immediate loading protocols and was, in this case, combined with the GFA abutment, with a conical connection and internal anti-rotational octagonal index, which is normally used for a single restoration on a single implant. The use of this prosthetic element, instead of a conventional multi-unit abutment, has a dual purpose. On the one hand, though maintaining sufficient platform shifting, it has a diameter 0.8mm narrower than the diameter of the multi-unit abutment, thus allowing 3.2mm greater biological space overall. On the other hand, the anti-rotational connection was employed for the abutments of all four single crowns, producing a better aesthetic result owing to a more individualised prosthetic restoration.

Conclusion

The rehabilitation of four maxillary incisors with four immediately placed implants, simultaneous regeneration with bone and connective tissue grafts, and an immediate loading protocol allowed us to obtain a satisfactory result thanks to the combination of key factors taken into account both in the surgical technique and the prosthetic strategy (in terms of components and type of restoration). The use of four implants placed in correct 3D position and combined with socket filling, the GFA abutments with platform shifting associated with the connective graft to generate a biotype change and the four single crowns placed into immediate function achieved adequate maintenance of hard and soft tissue and a natural and satisfactory appearance of the definitive restorations, despite the unfavourable bone conditions and the thin periodontal biotype observed in the preoperative phase.

about the authors



Dr Perla Della Nave is a Spain-based dentist who specialises in dental implantology. She studied dentistry at the European University of Valencia in Spain and obtained her degree in 2016. In addition, she holds master's degrees in oral surgery and implantology. She is currently in private practice in Valencia.



Dr Alberto Vericat Queralt is an oral surgeon who specialises in immediate implant loading. He has over 17 years of clinical experience in this field. In his private practice in Valencia in Spain, he also offers advanced solutions for complex cases such as a zygomatic implant placement.

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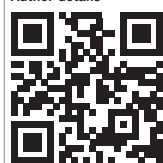
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Literature



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