

# Twenty eight months marginal bone level follow-up of an immediate post-extractive implant with immediate definitive loading

*Graziano Montaruli<sup>1</sup>, Alberto Dedola<sup>1</sup>, Khrystyna Zhurakivska<sup>1</sup>, Michele Laurenziello<sup>1</sup>, Michele Tepedino<sup>2</sup>, Renato Celletti<sup>3</sup>, Maurizio D'Amario<sup>2</sup>, Giuseppe Troiano<sup>1</sup>*

## SUMMARY

**Objective.** The aim of this case report was to show the marginal bone level (MBL) variation, after 28 months, around an aesthetic post-extraction implant immediate loading positioned in a 46-years-old woman.

**Material and methods.** After a careful evaluation of the X-rays and CBCT images, a 4×13 conical implant was placed in seat 21 after the atraumatic extraction of the fractured element and the management of the infected area.

Correct primary stability (torque 70 Ncm) was obtained by inserting the implant in a palatal position with respect to the alveolus.

To complete the surgery, regeneration procedures were carried out using a granular bone substitute (Geistlich Bio-Oss®) covered with a connective tissue graft taken from the palate. Just three days later, a straight titanium abutment Curvomax™ with gold tite (UNIHG) was screwed (35 Ncm) and a lithium disilicate glass ceramic crown was cemented.

**Results.** The radiographic analysis of the MBL at 28 months of follow-up shows a significant stability of the peri-implant bone confirmed by an excellent aesthetic integration of the soft tissues around the prosthetic crown.

**Conclusions.** A careful and dedicated surgical planning accompanied by the use of appropriate materials and an accurate surgical protocol, seems to allow the rehabilitation of frontal areas that is difficult to manage, obtaining excellent aesthetic, functional and predictable results over time. We believe that the goal, in this case, is also linked to the immediate delivery of the final crown which has significantly reduced operating times and improved aesthetic parameters, translating into better patient satisfaction.

**Keywords:** aesthetics, immediate loading, post-extraction implant.

## INTRODUCTION

Dental implant is a predictable solution for tooth replacement and now represents a valid rehabilitation technique in the routine clinical dental practice (1,2).

In the 20th century, however, the success of an implant therapy can no longer be attributed only

to the integration of the implant and its stability in the context of hard tissues, but must be sought in the timeliness of treatment and in the aesthetic integration of prosthetic artefact and peri-implant soft tissues, not always easy to manage.

In fact patient's requests are increasingly directed to these last two aspects and this has changed the dentist's approach to implantology and implant prosthesis and has pushed researchers to study the most suitable techniques to achieve these objectives (3).

Numerous recent studies show that the insertion of an implant at the same time as the dental extraction reduces the physiological reabsorption of the cortical bone with excellent implications from an aesthetic point of view (4).

<sup>1</sup>Department of Clinical and Experimental Medicine, School of Dentistry, University of Foggia, Italy

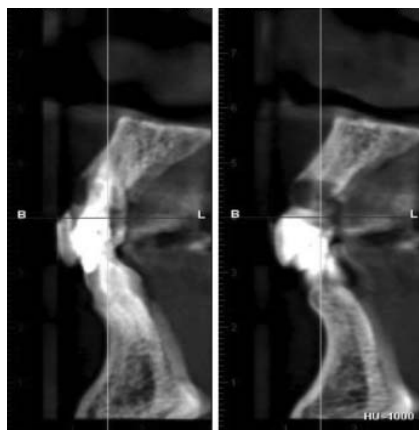
<sup>2</sup>Department of life, Health and Environmental Sciences, University of L'Aquila, Italy

<sup>3</sup>Department of Medical Oral and Biotechnological Sciences, University G. d'Annunzio Chieti, Pescara, Italy

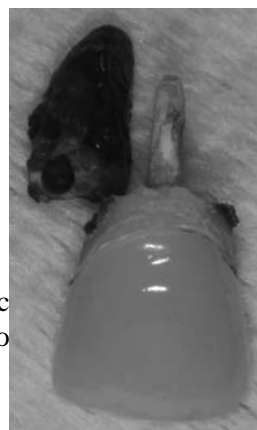
Address correspondence to Alberto Dedola, Department of Clinical and Experimental Medicine, School of Dentistry, University of Foggia, Via Luigi Rovelli n° 50, 71122 Foggia (FG), Italy.  
E-mail address: alberto.dedola@unifg.it



**Fig. 1.** The intraoral radiograph shows an area of radiolucency at the coronal third of the root



**Fig. 2.** Cone Beam Computed Tomography (CBCT) cross-section image of the element 2.1. The height and the thickness of the vestibular plate are reduced



**Fig. 3.** Dental element broken in two parts



**Fig. 4.** Post-extractive alveolus and neo alveolus made with implant drills



**Fig. 5.** Intra-operative X-ray immediately after implant placement

It is very important to underline that these results can be achieved by experienced operators and only after a dedicated pre-operative planning characterized by the study of radiographs and three-dimensional Cone Beam Computed Tomography (CBCT) images. In fact, there are many factors that can prevent the immediate insertion of an implant such as: a limited availability of quantity and quality of bone, factors related to the implant, as well as the need to place the prosthetically guided implant (5).

The presence of an infection, on the other hand, was seen not to determine a large risk factor as long as an adequate cleaning of the surgical area is performed before positioning the fixture (6).

Furthermore, it has been seen that a correct management of the prosthetic phase, obtained through a close collaboration between the dentist and the dental laboratory, can translate into greater predictability over time of the treatment.

Immediately loading the implant with a crown seems to result in better preservation of the peri-implant bone and better adaptation of the soft tissue (7). This underlines how a correct prosthetic load

plays a key role in the duration of an implant rehabilitation.

The objective of this case report, and therefore the goal of our implant-prosthetic-rehabilitation, aims demonstrate how to use an implant positioning technique immediately after dental extraction, associated with the immediate position-

ing of the final crown, can give excellent functional and aesthetic results demonstrated by a remarkable patient satisfaction.

## CASE REPORT

In November 2017, a 46-year-old patient in good health, who reported element 21 mobility, came to our attention.

After a careful history, which highlighted a thyroid disease treated by taking Eutirox, a periodontal chart was compiled which did not show hard and soft tissue pathology.

The patient had a thick phenotype.

Subsequently a site-specific intraoral X-ray was performed to observe the conditions of the element and the surrounding tissue.

The radiographic examination showed a radiolucency area at the coronal aspect of the root attributable to a fracture or reabsorption. The apical portion instead showed no alteration, nor signs of periapical inflammation (Figure 1).

With the purpose of rehabilitating the affected area through implant-prosthetic therapy, a CBCT, for a more careful and accurate evaluation of the residual hard tissues, and antibiotic therapy (amoxicillin 1g twice a day for six days) were prescribed at the patient.

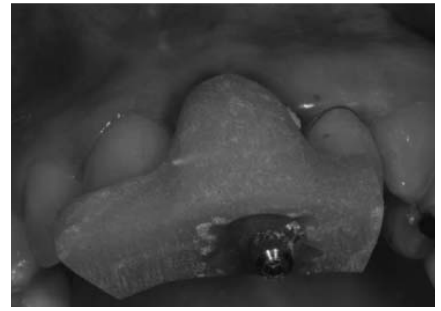
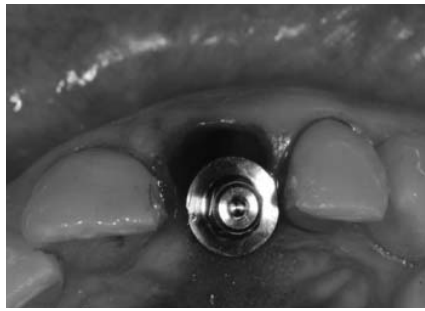
The analysis of the cross-section images of the CBCT confirmed the presence of a root fracture and a defect of the vestibular cortical bone: a factor influencing the surgical technique (Figure 2).

Clinically the crown of the element 21 migrated in the vestibular/occlusal direction, while the soft tissues had the typical aspect of inflammation (taut, shiny, edematous and reddened tissue).

After collecting the patient's consent for the case documentation, surgery was performed.



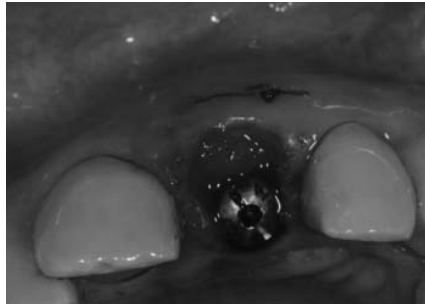
**Fig. 6.** Vestibular and occlusal vision of the surgical site that shows the palatal positioning of the implant compared to the post-extractive alveolus



**Fig. 7.** Resin jig



**Fig. 8.** Occlusal and vestibular vision of the implant with healing screw. Connective grafting and suturing are also observed



**Fig. 9.** 3 days after surgery. Positioning the straight curvemax abutment



**Fig. 10.** Endoral X-ray subsequent to cementation of the crown to verify the correct fixture / abutment coupling and the absence of excess of cement.



**Fig. 11.** 10 days follow-up after surgery: the image shows a good healing of soft tissues



### Surgical protocol

It was therefore decided to proceed with an atraumatic extraction of the element 21 in order to maintain as much residual bone tissue for a simultaneous insertion of a fixture.

Then, after the extraction of the tooth in two parts (Figure 3) by the help of sindesmotomy instruments, an accurate alveolus toilet was performed and the gingival margin was de-epithelialized in its internal side with periodontal scissors.

All granulation tissue was removed with alveolar spoons. However, there was no acute inflammatory lesion with purulent exudate formation.

The post-extraction alveolus was irrigated with hydrogen peroxide alternating with physiological solution.

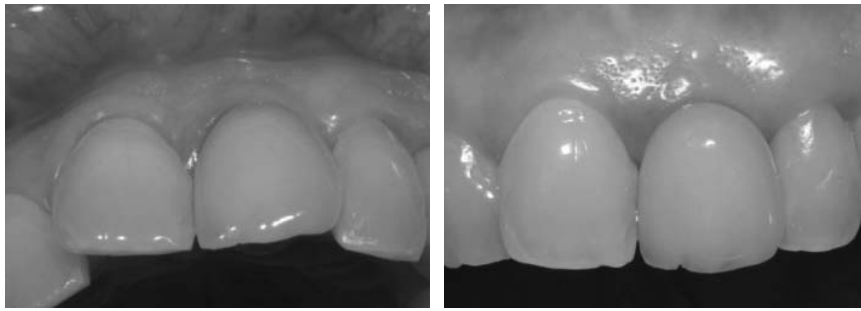
The planning involved the insertion of a titanium tapered implant 4×13 mm (BIOMET 3i<sup>TM</sup>NT413).

The new alveolus was made, through conical and then cylindrical preparation drills, in palatal position respect to the residual alveolus (Figure 4) in order to seek the greatest possible primary stability and positioning the implant with a prosthetically guided inclination.

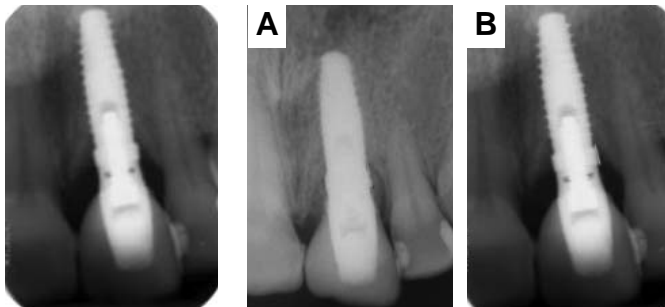
Then the positioning of implant, manually trying to obtain the best possible torque, was completed. A torque verifier showed the value of 70 Ncm: a good primary stability and an ideal condition for an immediate prosthetic load of the implant.

During the positioning phases of the fixture, the patient was repeatedly asked to close the mouth in to check the correct inclination of the implant without any interference.

An intra-operative control X-ray showed a correct mesio-distal inclination of the implant (Figure



**Fig. 12.** Buccal and occlusal aspect of the treated area two year (28 month) after surgery



**Fig. 13.** 28 month X-ray check. Stability of the peri-implant bone

**Fig. 14.** Radiographic measurement of I-MBL (A) and F-MBL (B)

5) to confirm the clinically appreciable situation (Figure 6).

In the same session, the position of the implant was detected by means of a self-hardening resin and a template joined to a straight coping (Figure 7). Then a healing abutment (diameter 4/4 mm, straight length 3 mm) was positioned.

To complete the surgery, with the aim of obtaining a regeneration of the vestibular bone and supporting soft tissues as much as possible, a granular bone substitute (Geistlich Bio-Oss®) was inserted, within the residual gap between the implant and vestibular tissues, subsequently covered with a connective tissue graft taken from the palate (Figures 8).

Three days after surgery a straight titanium abutment Curvomag™ (CV412) was placed (Figure 9). A resin positioning template (Ivoclar-Vivadent SR Ivolen®) was used to ensure a correct tightening of the gold tite (UNIHG) screwed at 35Ncm torque.

Lastly a lithium disilicate glass ceramic crown was cemented with temporary cement (Kerr Temp-Bond™). The occlusal contacts were checked and an X-ray was made to verify the correct fixture / abutment coupling and the absence of excess cement (Figure 10).

The patient, previously trained and motivated for an accurate oral hygiene, was subjected to a strict home and professional hygiene maintenance

protocol which also included medications with anti-septics (hydrogen peroxide and chlorhexidine digluconate) and chloride solution.

Ten days after surgery it was already possible to appreciate a good healing of the soft tissues and their adequate adaptation to the prosthetic crown (Figure 11). The same condition was also verified at the subsequent checks scheduled at 1 month and 2 year (Figure 12) with a good trophism of the vestibular aspect of the area undergoing surgery.

At 28 months follow-up, a control X-ray was performed which showed the presence of newly formed bone (Figure 13) thanks to the regeneration techniques used.

### Radiographic evaluation

In order to evaluate the variation of the bone levels around the implants over time, X-rays were digitally analyzed using the program FIJI by a single independent calibrated examiner.

The magnification of the radiographs was corrected in accordance with the clinical data (height and width) for each implant.

Measurements were therefore performed regarding bone height around the implant, both mesial and distal. Each measurement of the Marginal Bone Loss (MBL) was made starting from the implant platform and reaching the available bone crest (Figure 14).

A simple mathematical calculation was performed to calibrate and recalculate each linear MBL measurement according to the radiographic image size.

In this way it was possible to evaluate the initial MBL (I-MBL), when placing the prosthetic crown (T0), and final MBL (F-MBL), at 28 months of follow-up (T1), having evidence of bone reabsorption occurring around the implant.

### RESULTS

From the photographic documentation collected during the control sessions, it's possible to appreciate the maintenance of good peri-implant soft tissue conditions, characterized by the absence of signs of inflammation and by a valid adaptation to the prosthetic crown.

The immediate positioning of the final prosthetic crown proved to be remarkably advantageous for the maintenance of the regenerated bone thanks

to a correct discharge of the mechanical forces. From an aesthetic point of view the conditioning of the soft tissues (often difficult managed in the aesthetic areas) ever since the early stages of treatment is able to offer stable results over time.

The measurements performed on the T0 and T1 X-rays showed a satisfactory maintenance of the MBL.

The mesial I-MBL was 1.635 mm while the mesial F-MBL was 0.974 mm; otherwise the distal I-MBL was 1.907 mm and the distal F-MBL was 1.671 mm.

Ultimately, although much of the grafted bio-material has gone to be reabsorbed, the MBL was even increased (Figure 14).

## DISCUSSION

Within the limits of a single selected case, we can state that after a thorough pre-operative planning and respecting the correct surgical protocols it is possible to manage complex cases in a highly aesthetic area with excellent long-lasting biological and aesthetic results.

The literature tells us that there are no statistically significant differences regarding failures, complications and patient satisfaction between single implants positioned immediately, at 6 weeks or 4 months after dental extraction; nevertheless, failures are more frequent in the first two conditions (8).

If the changes in bone are similar in all three procedures, the best aesthetic results are obtained in cases of immediate or immediate / delayed placement (6 weeks) of the implants (9).

As confirmation, the analysis of the MBL from the radiographs at 28 months of follow-up carried out in this study showed a maintenance of the mesial and distal peri-implant bone that was even increased.

## CONCLUSIONS

It is not possible to define which of the procedures used in the protocol is more responsible for the excellent results obtained, but what the authors want to underline with this work are the advantages related to time, aesthetics and function resulting from the immediate positioning of a suitable prosthetic crown, inviting to deepen this aspect with studies including a greater number of cases (10).

Certainly, this technique is not always possible and must be adopted exclusively in ideal patient health conditions, following the achievement of primary stability such as to guarantee an immediate load (11) and thoroughly motivating the patient to maintain good hygienic conditions, an important factor for the predictability of the treatment over time.

## STATEMENT OF CONFLICTS OF INTEREST

The authors state no conflict of interest.

## ACKNOWLEDGEMENTS

The authors would like to thank Giuseppe Soldano and Danilo Altamura for their precious contribution to this paper like dental technicians.

## REFERENCES

- Albrektsson T, Donos N. Implant survival and complications. The Third EAO consensus conference 2012. *Clin Oral Implants Res.* 2012 Oct; 23 Suppl 6:63-5. [doi: 10.1111/j.1600-0501.2012.02557.x.]
- Esposito M, Ardebili Y, Worthington HV. Interventions for replacing missing teeth: different types of dental implants. *Cochrane Database Syst Rev.* 2019 Oct 10;10(10):CD003815. [doi: 10.1002/14651858.CD003815.pub5.]
- Esposito M, Grusovin MG, Polyzos IP, Felice P, Worthington HV. Timing of implant placement after tooth extraction: immediate, immediate-delayed or delayed implants? A Cochrane systematic review. *Eur J Oral Implantol.* 2010 Autumn;3(3):189-205. [MEDLINE: 20847990]
- Schropp L, Wenzel A. Timing of single implant placement and long-term observation of marginal bone levels. *Eur J Oral Implantol.* 2016;9 Suppl 1:S107-22. [MEDLINE: 27314115]
- Swathi KV. Immediate Implants Placement-A Review. *J. Pharm. Sci. & Res.* 2016; 8: 1315-1317.
- Schropp L, Isidor F. Timing of implant placement relative to tooth extraction. *J Oral Rehabil.* 2008 Jan;35 Suppl 1:33-43. [doi: 10.1111/j.1365-2842.2007.01827.x.]
- Raes F, Eccellente T, Lenzi C, Ortolani M, Luongo G, Mangano C, et al. Immediate functional loading of single implants: a multicenter study with 4 years of follow-up. *J Dent Res Dent Clin Dent Prospects.* 2018 Winter;12(1):26-37. [doi: 10.15171/joddd.2018.005. Epub 2018 Mar 14.]
- Tonetti MS, Cortellini P, Graziani F, Cairo F, Lang NP, Abundo R, et al. Immediate versus delayed implant placement after anterior single tooth extraction: the timing randomized controlled clinical trial. *J Clin Periodontol.* 2017 Feb;44(2):215-224. [doi: 10.1111/jcpe.12666. Epub 2017 Jan 31.]
- Esposito M, Zucchelli G, Cannizzaro G, Checchi L, Barausse C, Trullenque-Eriksson A, et al. Immediate, immediate-delayed (6 weeks) and delayed (4 months) post-extractive single implants: 1-year post-loading data from a randomised controlled trial. *Eur J Oral Implantol.* 2017;10(1):11-26. [MEDLINE: 28327692]

10. Kan JYK, Rungcharassaeng K, Deflorian M, Weinstein T, Wang HL, Testori T. Immediate implant placement and provisionalization of maxillary anterior single implants. *Periodontol 2000*. 2018 Jun;77(1):197-212. [doi: 10.1111/prd.12212. Epub 2018 Feb 25.]
11. Buser D, Chappuis V, Belser UC, Chen S. Implant placement post extraction in esthetic single tooth sites: when immediate, when early, when late? *Periodontol 2000*. 2017 Feb;73(1):84-102. [doi: 10.1111/prd.12170.]

Received: 12 11 2020  
Accepted for publishing: 23 06 2023