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Original Research Article **Oral Implantology**

Narrow Single Implants with a Reduced Platform (3.0) for the Resolution of Punctual Horizontal Atrophies in the Canine and Premolar Area: Case Series

Eduardo Anitua DDS, MD, PhD[1,2,3*]

[1]Private Practice in Oral Implantology, Eduardo Anitua Institute, Vitoria, Spain
[2]Clinical Researcher, Eduardo Anitua Foundation, Vitoria, Spain
[3]University Institute for Regenerative Medicine and Oral Implantology- UIRMI (UPV/EHU-Fundación Eduardo Anitua), Vitoria, Spain

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***Corresponding author:** Eduardo Anitua DDS, MD, PhD
Private Practice in Oral Implantology, Eduardo Anitua Institute, Vitoria, Spain

Abstract

Introduction: Severe unitary atrophies in the horizontal direction make the direct insertion of dental implants difficult. Block grafting or guided bone regeneration in small sites is also complex, sometimes requiring a highly predictable option. The insertion of small-platform, low-diameter implants can be a safe and effective alternative for these sites, even on a single-unit basis. In the following article we present a series of cases rehabilitated with these implants. ***Material and Methods:*** Patients with horizontal atrophy of a tooth requiring the insertion of a single implant in the premolar and canine area were recruited, and 3 mm platform implants with a diameter of 3.3 mm were placed between May 2018 and December 2019 in a dental clinic in Vitoria, Spain. Marginal crestal bone loss was calculated by measuring from the implant shoulder to the first site where bone-to-implant contact was evident. The reference for comparing the radiographic records and thus estimating the bone loss produced in each of the patients was the radiograph taken at the time of prosthesis insertion. Qualitative variables were described by frequency analysis. Quantitative variables were described by means of mean and standard deviation. Implant survival was calculated using the Kaplan- Meier method. ***Result:*** Eight patients were recruited and eight 3.0 implants were placed in the canine and premolar region in a unitary form with a diameter of 3.3 mm. All implants were rehabilitated in a unitary form, in two phases, using a screw-retained prosthesis with unitary transepithelial. The mean follow-up time was 39.8 months (+/- 18). Survival of the implants studied was 100% and of the prostheses as well. The mean mesial crestal bone loss of the implants studied was 0.77 mm (+/- 0.01) and distal bone loss was 0.35 mm (+/- 0.7). ***Conclusions:*** Implants with a reduced diameter and platform can be used as a unit provided that a correct surgical and prosthetic treatment plan is followed, analysing the case as a whole and individualising the approach for each patient.

Keywords: Narrowimplant, reducedplatform, unitary.

INTRODUCTION

Bone atrophy in the vertical and horizontal direction limits the insertion of dental implants, sometimes requiring an initial approach to regenerate the lost bone volume prior to implant placement in a second phase, or in the same surgical phase, depending on the procedure and the implant used [1, 2]. When bone atrophy is limited to a single tooth, performing these augmentation procedures for a single implant tips the balance towards minimally invasive surgical techniques and restorative protocols that allow us to resolve the case with the least possible intervention. Narrow implants with a reduced platform have been developed for this type of situation, in addition to being used as support abutments in complete or sectorial restorations in cases with limited bone volume in width [3-6]. In the international literature, a narrow or reduced diameter implant is considered to be one with a diameter ≤3.5 mm1-5. In the classification drawn up by Klein *et al.*, in 2014 [5], these implants are subdivided into three groups according to their diameter, in order to better compare the parameters relating to their survival and long-term biomechanical behaviour, by creating more homogeneous groups. These groups are: Category

1: <3.0 mm ("mini-implants"), category 2: 3.0-3.25 mm and category 3: 3.30-3.50 mm5. Implants below 3 mm in diameter, in the majority of studies, are monobloc and serve as anchorage for the retention of overdentures, with few studies including implants of this size in two pieces (implant and prosthesis), being recommended as support abutments for rehabilitations that include more implants of larger diameter, in most cases [5-8]. In 2016, our study group published a study evaluating the survival of 2.5 mm diameter implants rehabilitated by splinting to other implants with a survival rate of 97.3%, achieving excellent long-term results, avoiding the need for regeneration in areas with extreme horizontal atrophy [7]. Implants with a diameter of 3.5 mm can currently be considered to have the same survival rate as implants with a larger diameter, being included in the group of "narrow" implants, but being the representatives of this group with the lowest risk when it comes to their rehabilitation, both as single implants and as part of bridges, even with insertion in posterior areas (molars and premolars), with survival rates of between 91.4% and 97.6% [5, 9]. Implants with a diameter of 3.30 mm belong to the intermediate group of those considered narrow implants. In the studies that report their survival rate, it is 97.3 ± 5% after a mean follow-up of 29 ± 17 months [5]. Most of the implants in this category, when placed as a single unit, are inserted to replace agenesis lateral incisors or mandibular incisors, with very few locations outside this area [5, 10, 11]. Furthermore, the implants studied with this diameter of 3.30 have, in the majority of cases, a platform greater than or equal to this diameter, with few cases evaluated of implants with a smaller diameter platform (below 3.30 mm) [9-13]. In this article, we present a series of clinical cases treated with single implants in the canine and premolar area with implants of 3.3 mm in diameter with a reduced platform of 3 mm (implant 3.0, Biotechnology Institute, Álava, Spain), for the resolution of cases of punctual horizontal atrophy limited to one dental piece without previous bone regeneration techniques.

MATERIAL AND METHOD

Patients with horizontal atrophy of a tooth that required the insertion of a single implant in the premolar and canine area were recruited and implants with a 3 mm platform and a diameter of 3.3 mm were placed between May 2018 and December 2019 in a dental clinic in Vitoria, Spain.

Prior to implant insertion, an antibiotic pre-medication consisting of amoxicillin 2g orally one hour before surgery and paracetamol 1g orally (as an analgesic) was used. Subsequently, patients were treated with amoxicillin 500- 750 mg orally every 8 hours (according to weight) for 5 days. All patients were studied before implant insertion by means of diagnostic models, intraoral exploration and a dental CT scan (Cone-bean) subsequently analysed by means of specific software (BTI-Scan III). The intervention was performed under local anaesthesia and the drilling was carried out at low speed (biological drilling), generating an expansion with the motorised expanders and the subsequent insertion of the implant, which condenses the bone instead of removing it, which is very useful in these cases of horizontal atrophy (figure 1) [14]. For the estimation of marginal bone loss, a known length on the radiographs (implant length) was taken as a reference to calibrate the measurements taken on these radiographs. From the calibration the software used calculates the actual measurements (Digora for Windows, SOREDEX Digital Imaging systems). The marginal crestal bone loss was calculated by measuring from the shoulder of the implant to the first site where bone to implant contact was evident. The reference for comparing the radiographic records and thus estimating the bone loss in each patient was the radiograph taken at the time of prosthesis insertion. This radiograph was therefore used as the starting point for all subsequent measurements.

The implant was the unit of analysis for descriptive statistics in terms of location, implant dimensions, and radiographic measurements. The primary variable was implant survival and as secondary variables mesial and distal bone loss was recorded.

A Shapiro-Wilk test was performed on the data obtained to verify the normal distribution of the sample.

Qualitative variables were described by frequency analysis. Quantitative variables were described by means of mean and standard deviation. Implant survival was calculated using the Kaplan-Meier method. Data were analysed with SPSS v15.0 for windows (SPSS Inc., Chicago, IL, USA).

RESULTS

Eight patients were recruited and eight 3.0 implants were placed in the canine and premolar areas in a single unit with a diameter of 3.30 mm. Seventy-five percent of the patients were female with a mean age of 59.6 years (+/- 6.5). Implant lengths ranged from 6.5 to 8.5 mm. The most frequent location was for position 15 (37.5%) followed by location 24 (25%). The remaining locations and lengths of the implants included in the study are shown in figure 2.

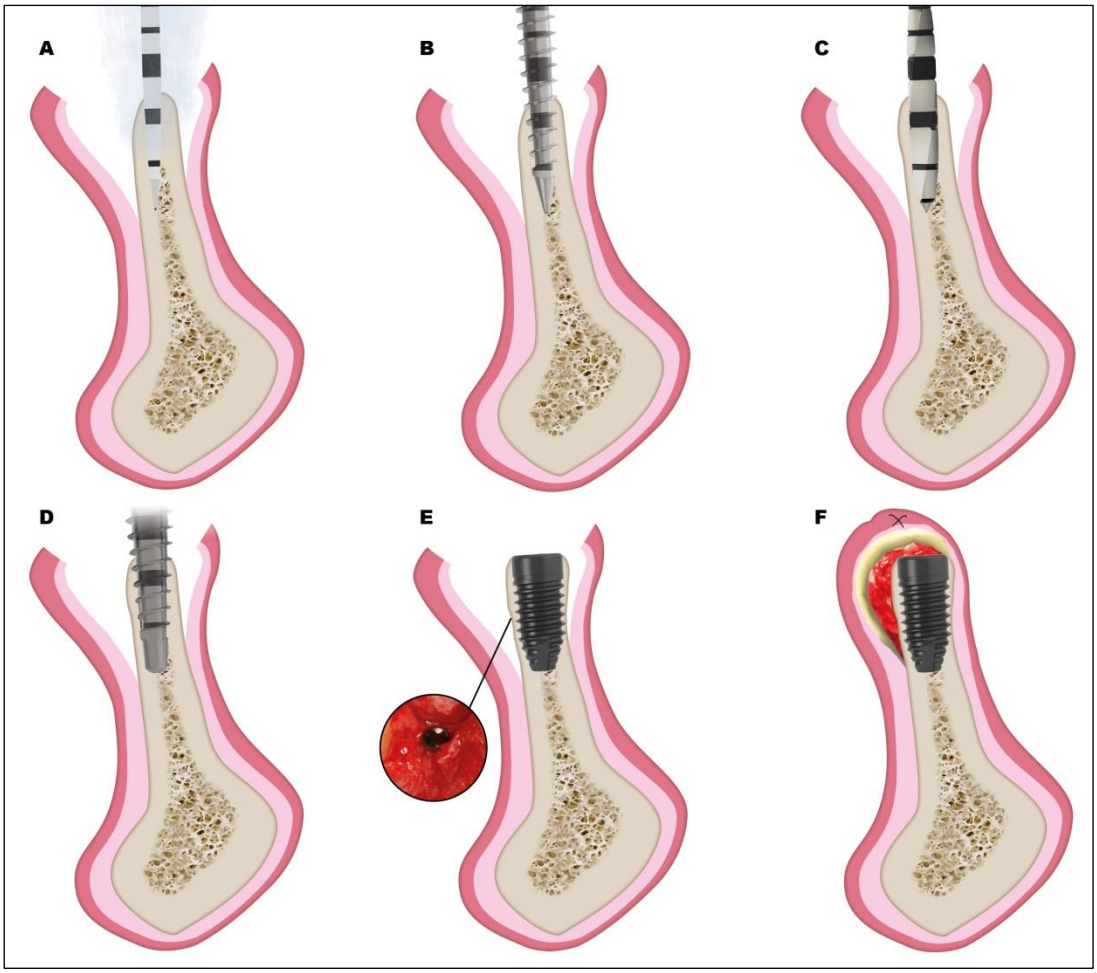


Figure 1: Drilling with compaction of the bone bed for insertion of the narrow platform implant. A) Starting drill at high speed and with irrigation up to working length. B) First motorised expander that laterally compacts the bone bed. C) 1.8 mm drill without irrigation as described in biological drilling to slightly widen the alveolus. All particulate bone obtained is collected and stored contained in Endoret-PRGF until use. D) Insert of the second motorised expander. E) Insertion of the implant, which completes the expansion. F) Final overcorrection with autologous obtained from drilling and covering of the entire surgery with an activated and retracted fibrin membrane. Suture of the flap

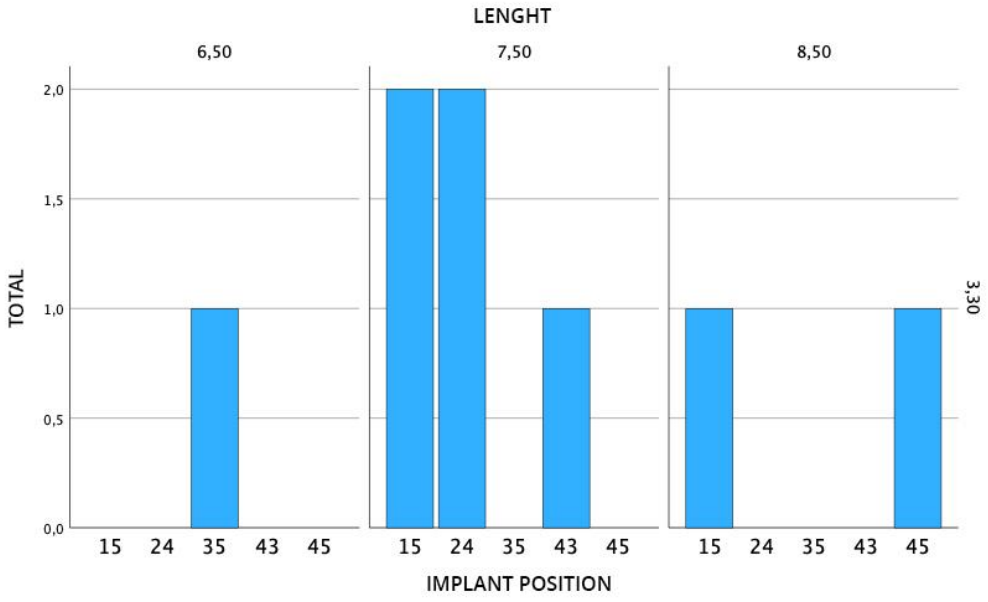


Figure 2: Lengths of the implants included in the study according to their anatomical location

None of the patients were smokers, ingested alcohol or had relevant systemic pathologies. No bruxism or parafunctions were recorded in any of the cases. The mean implant insertion torque was 34.3 Ncm (+/- 19.5) and the mean bone density at the implant placement site was 781.2 Hu (+/- 175.1). All implants were rehabilitated in a two-stage single-stage screw-retained prosthesis with a single transepithelial. The implant antagonist was a natural tooth in 50% of the cases and an implant in the remaining 50%. The mean follow-up time was 39.8 months (+/- 18). Survival of the implants studied was 100% and of the prostheses as well, with only one adverse event recorded in one of the prostheses, which was the loosening of the retention screw on one occasion. The mean mesial crestal bone loss of the implants studied was 0.77 mm (+/- 0.01) and distal bone loss was 0.35 mm (+/- 0.7).

One of the cases included in the study is shown in figures 3 - 18.

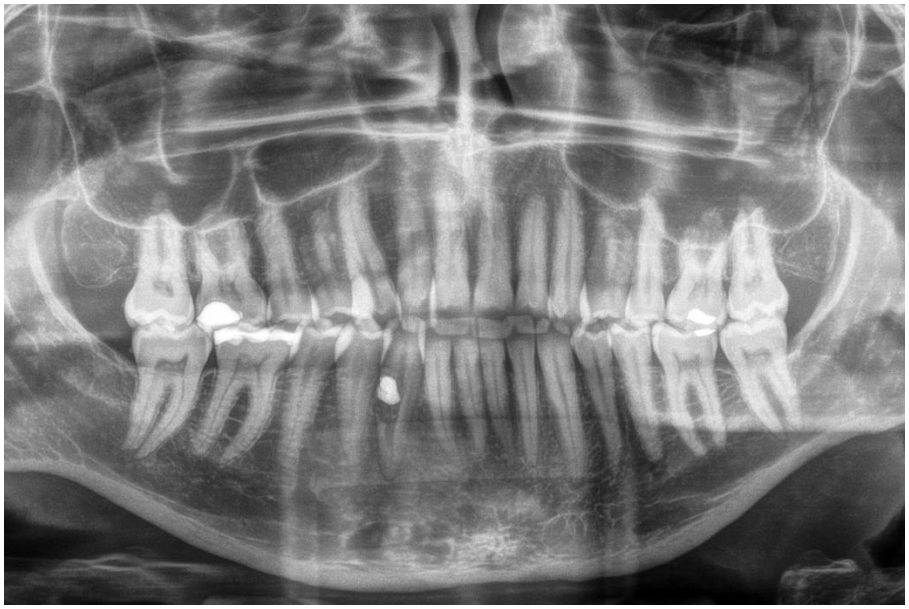


Figure 3: Initial X-ray of the patient showing a lytic lesion at the root of tooth 43

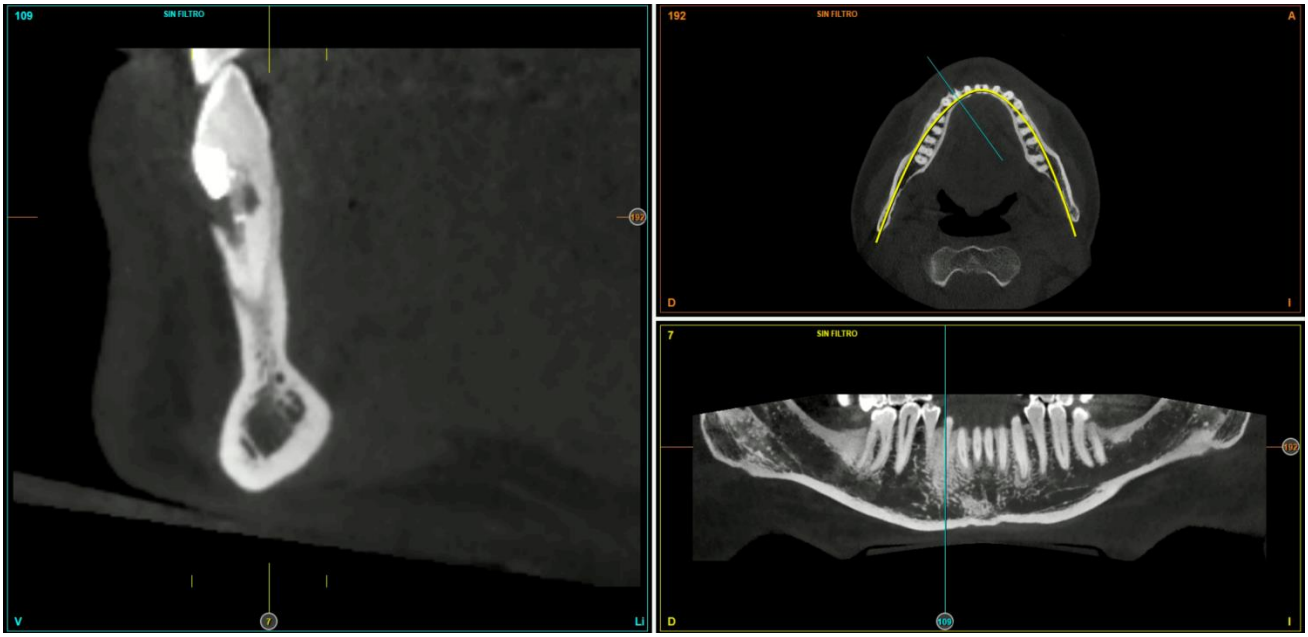


Figure 4: Diagnostic Cone-beam section showing external resorption of the root of the canine, affecting the pulp chamber and compromising its integrity, so it must be extracted. In addition, the small width of the alveolar ridge at this level is already visible. The patient was in pain and there was suppuration in the affected tooth

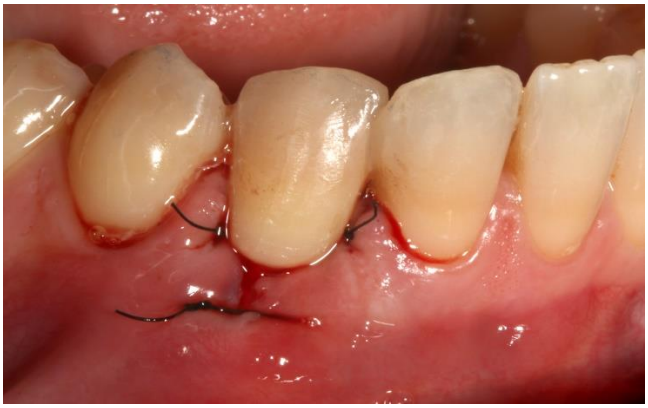
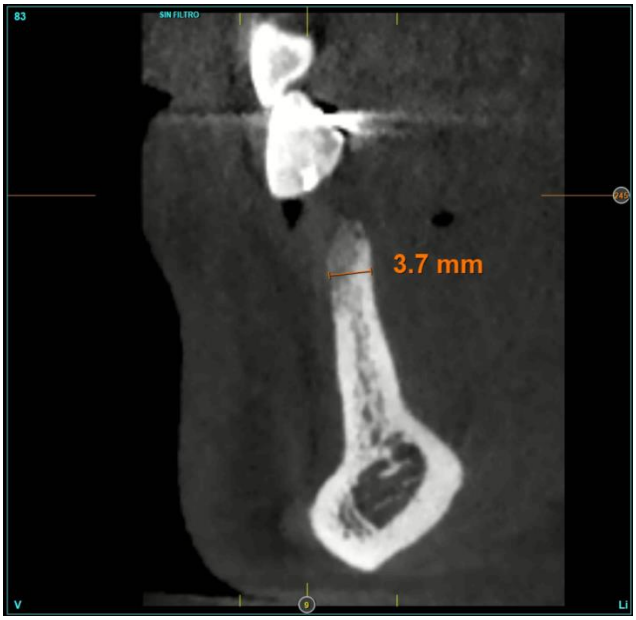
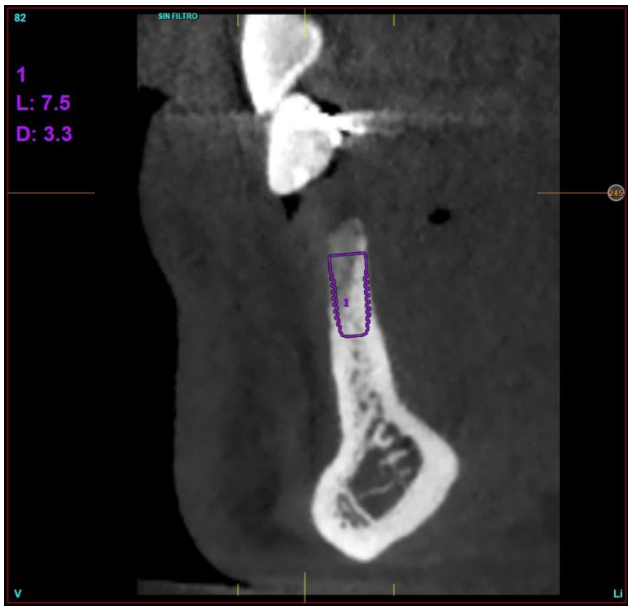
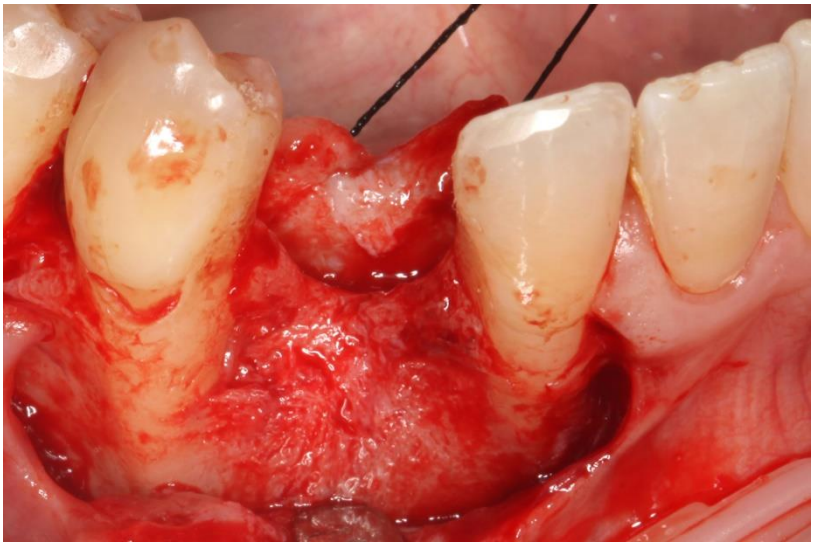


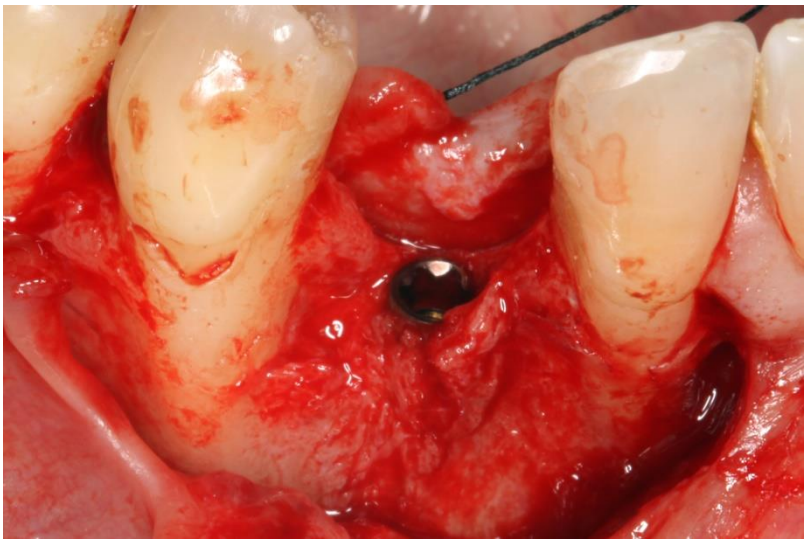
Figure 5: The tooth was extracted as atraumatically as possible and the alveolus was regenerated with Endoret-PRGF, and the tooth itself, splinted with composite, was temporarily attached to the adjacent teeth





Figures 6 and 7: Tac of planning once the socket has regenerated after 2 weeks. We can see that although the socket has regenerated perfectly, we have a bone width of less than 4 mm for the placement of the implant, so a 3.0 platform implant with a diameter of 3.3 mm and a length of 7.5 mm is planned





Figures 8 and 9: Intraoperative images of implant placement. We can see how the reduced platform (3 mm) has allowed us to conserve the vestibular table to the maximum, which has suffered a slight incomplete fracture during implant insertion due to compression of the implant during expansion

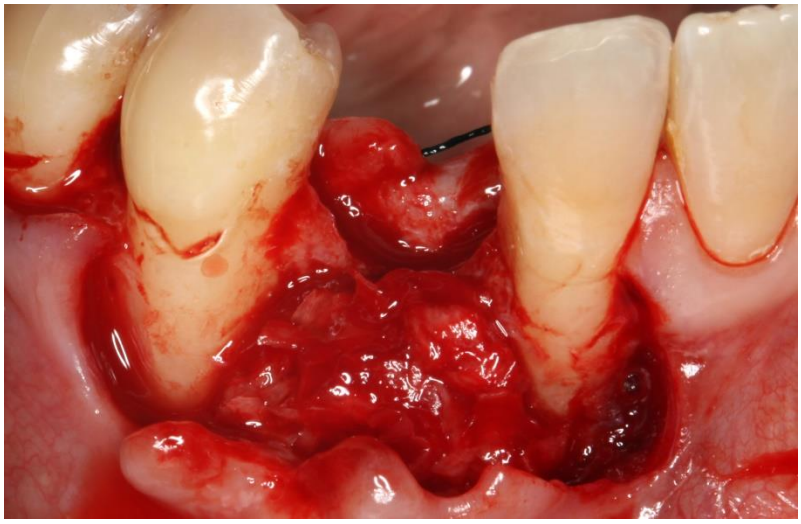
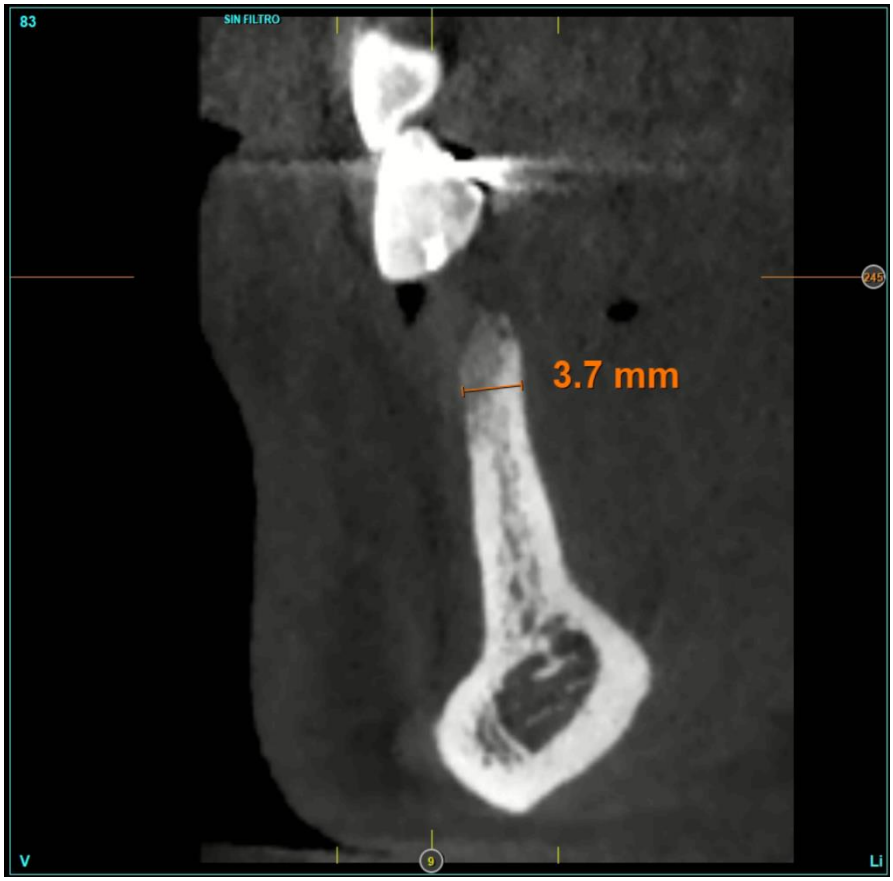
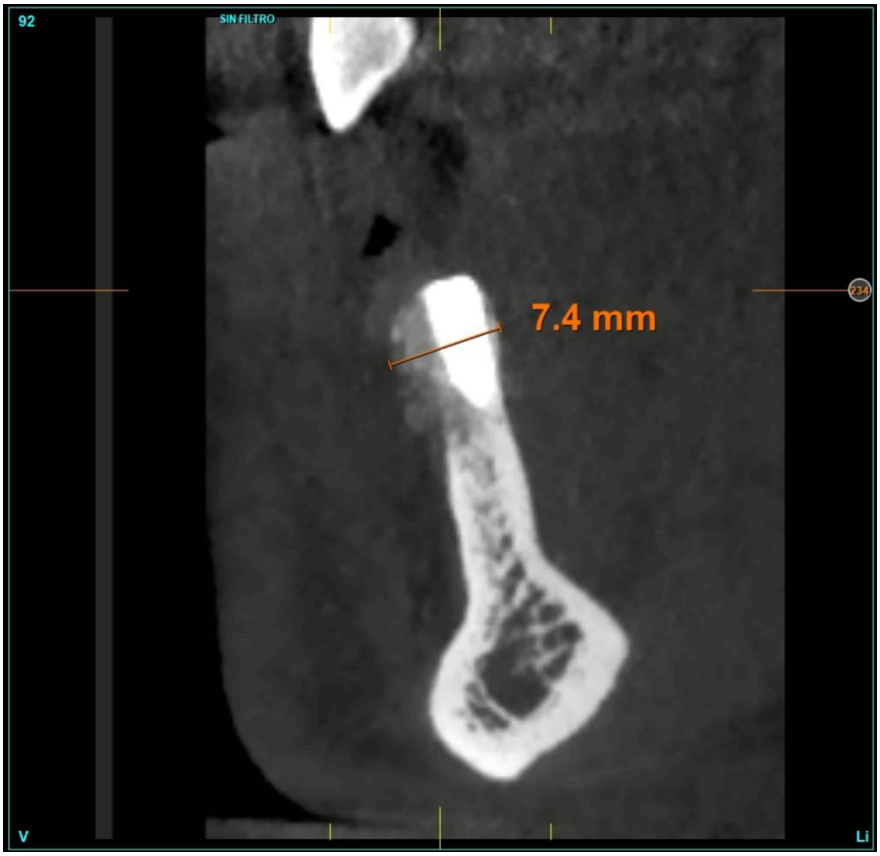
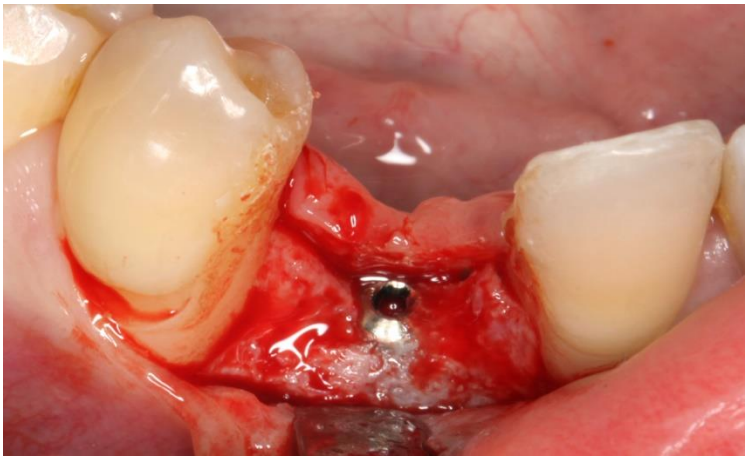


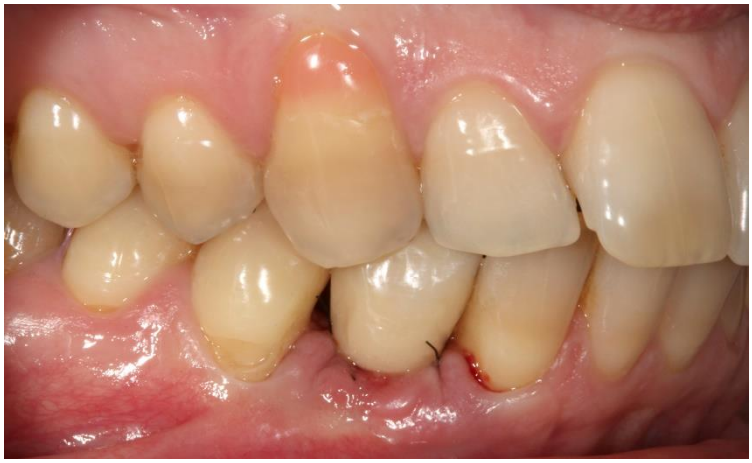
Figure 10: Placement of autologous bone obtained by scraping the mandibular retromolar area of the same quadrant and embedded in PRGF-Endoret to overcorrect the area and achieve greater bone width at this level. The entire area is covered with fibrin membranes (fraction 1-PRGF-Endoret), activated and retracted



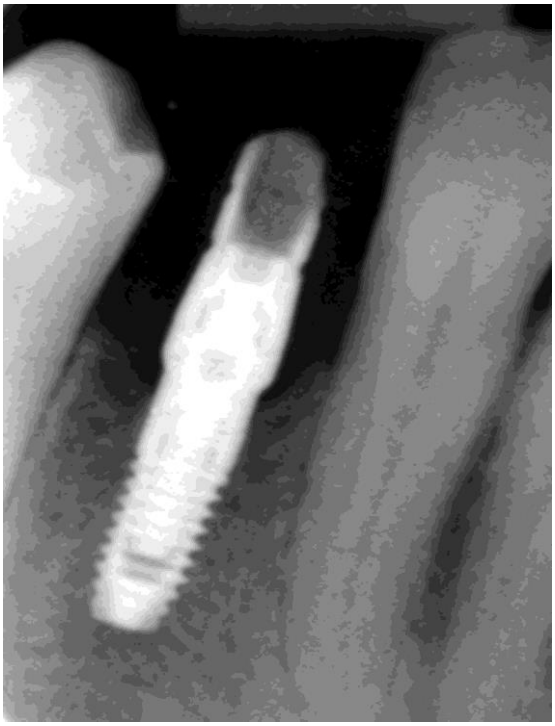


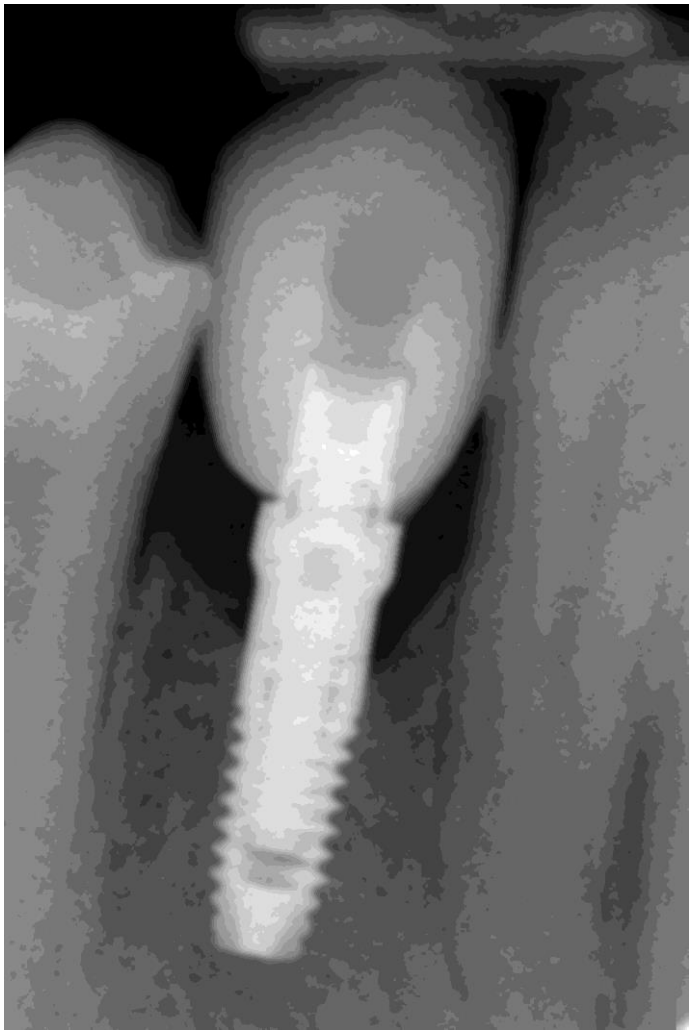
Figures 11 and 12: Tac three months after implant and graft placement, where we can see the gain achieved with the procedure, which has doubled the existing bone width





Figures 13 and 14: Image of the surgical re-entry where we can see the width that could be directly quantified in the CT scan and the placement of a provisional that allows us to condition the tissues and give progressive loading to the implant after the second surgical phase. This provisional is placed a few hours after the second surgery using a screw-retained prosthesis and a unitary transepithelial





Figures 15 and 16: X-ray with the placement of the provisional after the second phase where we can see the transepithelial and the provisional post and the definitive reconstruction by means of an interface on the unitary transepithelial and the all-ceramic crown cemented to the interface

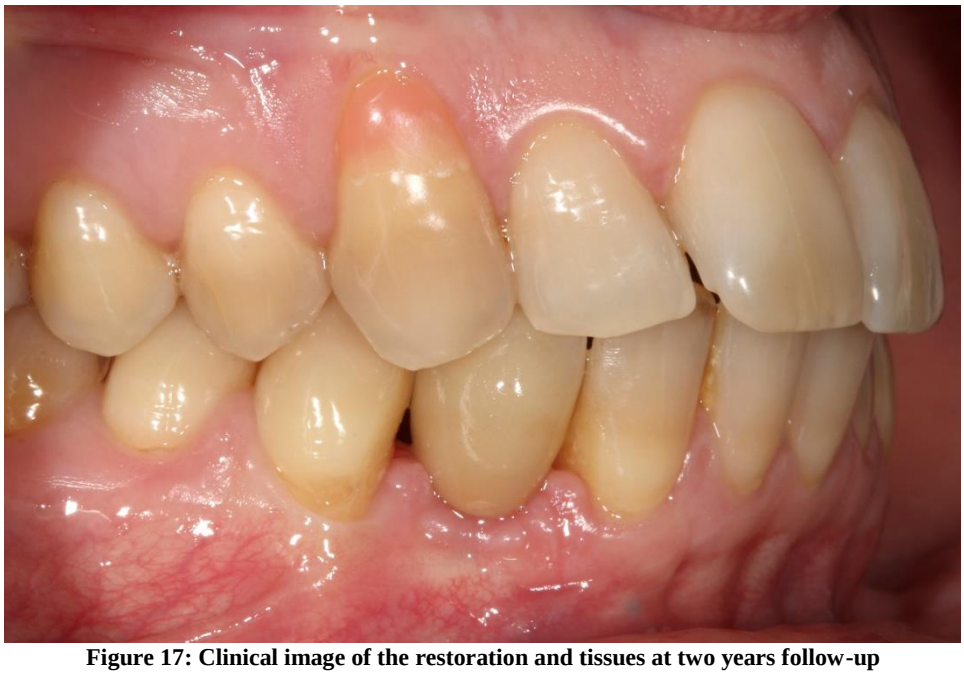


Figure 17: Clinical image of the restoration and tissues at two years follow-up

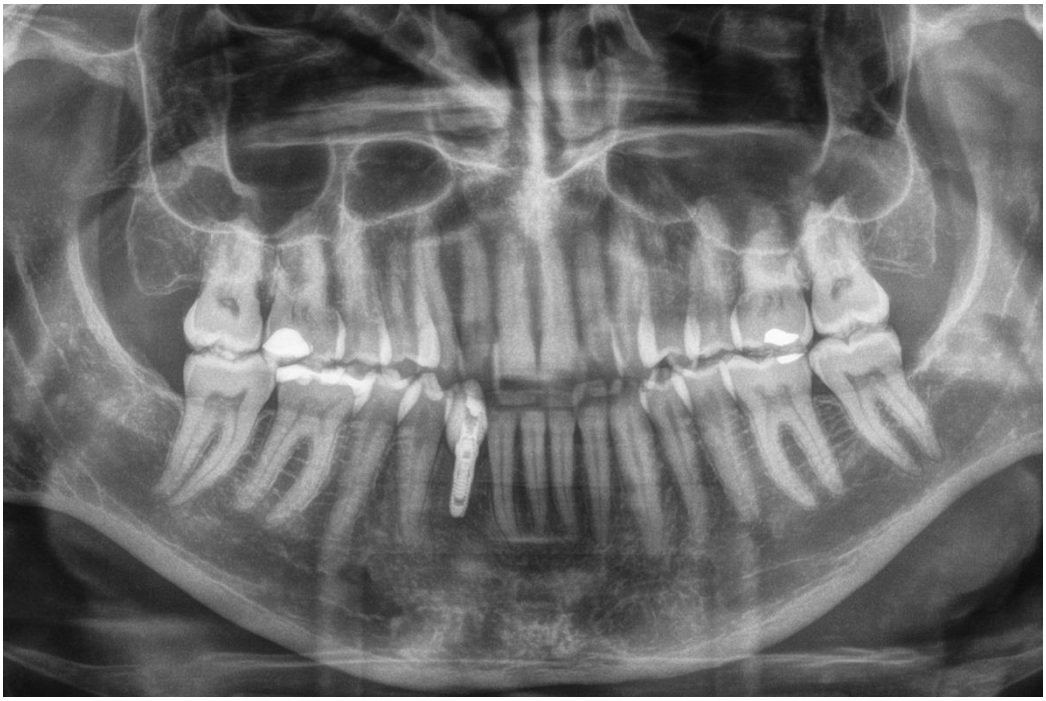


Figure 18: Final radiograph after two years of follow-up. We observe the stability of the treatment with no associated bone loss in the implant area

DISCUSSION

Narrow implants with a reduced platform are indicated when there is little bone horizontally, or when there is a reduced interdental space, where the placement of a larger diameter platform may put the bone adjacent to the implant and therefore the surrounding teeth at risk [1, 5, 7, 15, 16]. Typically, implants of 3 and 3.3 mm in diameter have wider platforms, compromising the crestal bone around the platform, which is the most critical area where subsequent bone resorption can occur due to ischaemia generated by high platform torque at this level. The design of these new 3.0 implants has allowed us to have an implant (in this case 3.3 mm) with a 3 mm platform, which guarantees less compression in the most critical area, as well as producing less emergence at the level of the soft tissues, generating more space for them in the prosthetic phase, which means that long-term stability of both gingival tissue and bone is more easily maintained [17, 18]. When these implants are also inserted as a single unit, if the case, the position and the subsequent prosthetic rehabilitation have been correctly selected, there is no influence on the success of the treatment when comparing these implants with other implants that can be considered "conventional" in diameter [1, 7, 8, 19]. The long-term survival rate of narrow implants has been evaluated in some studies, with an 8-year survival rate of 96.9% for narrow implants splinted to other implants [1, 13, 20]. Other studies evaluating these implants in unitary aesthetic zones in the long term report 100% survival with a follow-up of between 3 and 14 years [21]. In our case, the implants have been inserted in a unitary form, in canine-premolar areas, and the success rate has reached 100%, thus achieving very good survival, even in situations where a narrow unitary implant could perform less well, such as in the posterior sector. Even so, more studies are needed to evaluate these implants in a single unit in the same type of rehabilitation (extreme horizontal resorption, canine-premolar sector) to confirm the data provided by this series of cases, which are promising in principle.

CONCLUSIONS

Implants with a reduced diameter and platform can be used as a single unit as long as a correct surgical and prosthetic treatment plan is followed, analysing the case as a whole and personalising the approach for each patient. The classic replacement area with these implants (upper and lower incisors) can be extended to other locations as long as the implant insertion procedure is careful with the receptor bed and the prosthesis is made according to a specific protocol, such as a screw-retained prosthesis using an intermediate element, as we have shown in this series of cases.

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