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Research Article

New Concept and a New Perspective in the use of One Piece Dental Implants

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Abstract

One piece implantology after wide spread diffusion in the second half of the last century saw its application significantly reduced by dental implantologists. The main reason of a progressive reduction was the Brakeman concept of implant Osseo integration, although now the most recent knowledge allows reducing the timing on implant loading. Another significant factor is attributable to the prosthetic difficulties compared to two-pieces devices and to the technological limits that have made the one piece implants not suitable for the paradigms of modern implantology. The intent of the authors is to repropose one piece implantology and highlight the use of medical devices designed and built in the past, but contextualized currently in light of the technological improvements available today so that they can be considered as a valid alternative to the others implant methods.

Introduction

Going through the evolution of medical devices in the history of implantology, it is clear that for technical and technological reasons the first to be available to clinicians in the second half of the last century were mainly monobloc or one-piece type devices [1]. The reasons for the diffusion of this type of implant are mostly due to the technological context of the time when scientific research and industrial tools did not allow the creation of qualitatively adequate and clinically performing two-phase fixtures, as happened after the 1980s with the exposition of Branemark's osseointegration principles. The next orientation in implant techniques was, therefore, that of retirement with subsequent loading and functionalization of implant-prosthetic rehabilitation. These paradigms currently, thanks to scientific research, clinical evidence and industrial development have been widely overcome and there's the possibility of immediate biomechanical loads on implant devices. The realization, including all its features (micro - and macro - design, treatment surface, fixture - screw - abutment connection) of increasingly performing and qualitatively better devices allows a significant increase in the success of implant rehabilitation - prosthetics [2]. Despite the very high percentages of success, there is however persistent critical issues of the biphasic implant device, both from a clinical point of view but overall.

Biomechanical (unscrewing, fractures, fracking, micro-infiltration, pumping effect). The monoblock implant, if from a clinical point of view certainly has some limitations of use; however from the biomechanical point of view it has an indisputable greater performance in mechanical strength and in the distribution of loads [3]. From an engineering point of view we can certainly affirm the superiority of a monobloc structure compared to devices that require more components such as biphasic implants, but it is necessary to take note of some limits of clinical use of one-piece implants.

Among these, those most highlighted by research as well as by users are: [4].

- Need good surgical planning
- Need good prosthetic project
- Prosthetic preparation and intraoral milling of the pillar
- Management of the implant abutment insertion/inclination
- difficulty in working on prosthetic plaster models
- possibility to perform only cemented technique

However, there are considerable application advantages to these limits which are added to the biomechanical ones [5].

- Absence Of Micro Gap And Micro Infiltration
- Absence Of Pumping Effect
- Absence Of Components
- Use In Sectors Of Small Diameter
- Prosthetic And Laboratory Simplification
- Better Maturation Of Soft Tissues During The Healing Phase
- Economic Sustainability

Viewing recent scientific literature, it is a certain advantage the concept of one - abutment one - time [6]. This paradigm explains that in addition to limit wear and damage of the prosthetic components, it avoids the risks of bacterial contamination between different surfaces of the biphasic devices and to compromise the peri-implant healing tissues.

[7]. Furthermore, the engineering concept is widely consolidated that every insertion of an additional component and every modification in a structure becomes locus minoris resistentiae from the biomechanical point of view [8]. Annalisa agile element finite per la definition Della distribution deli stress mechanic newly implant. Dental Cadmus, from these assumptions was born the idea of using one-piece implant devices with the aim of overcoming clinical limits thanks to industrial development and the technologies currently available. In this publication, the intend of the Authors is to present an implant-prosthetic rehabilitation technique that involves the use of one-piece implants aimed at enhancing the biomechanical advantages and exceeding the clinical limits previously described. Happy System is a *no touch concept* of one piece devices that provides for the absence of modification, bending and supragingival preparation of the pillar for prosthetic purposes, the absence of superstructures, such as econometric or parallel copings, limitation or absence of cement in the insertion of dental prosthesis, precision of rehabilitation through the use of impressions with transfer copings and laboratory analogues, pending the creation of scan abutments that will allow to complete the entire digital supply chain.

Materials and Methods

Currently the use of one-piece implants is limited among implantologists compared to multi-component devices. The reasons can be the initial surgery difficulties, the clinical management and the advantage to delegate the development of the prosthetic components to the technician. Despite this, the commercial offer of monopoly devices is very wide, especially for the wide diffusion in countries beyond Italy, probably for assessments related to the sustainability of dental care. In the author's experience there are numerous types of devices, which have allowed the identification of the selection criteria and the evidence of the most suitable use technique.

The method presented in this work was developed on VIP monophasic implants (Future Implant System - Italy). The materials used for the prosthetic component are peek, for the structure, and dental composite coating for the aesthetic and functional part. Bio HPP is a partially crystalline high performance polymer, thermoplastic and stable at high temperatures, based on PEEK (polyetheretherketone),to which inorganic ceramic micro particles have been added, with a diameter of <0.5 μm. This process allows to maintain both physiological elasticity and to give the material an adequate rigidity with the possibility of polishing. The peek, or Bio HPP, having a coefficient of elasticity very similar to bone tissue, allows reducing the maximum values of the bite forces both vertically and laterally compared to other materials, such as titanium, zirconium and ceramic. The material is suitable both for the creation of crowns and dental bridges on natural teeth, removable prostheses and superstructures of implant-supported prostheses [9].

The Happy System method, first of all, involves the surgical insertion of the one piece implant device, following the criteria of limiting the inclination of the pillar by 15 ° to the ideal dental axis. The line of the correct implant insertion can be performed with traditional design techniques on radiographic investigations, study models or stereo lithography, prosthetic guides or with the help of the most recent computer aided implantology methods.After the healing phase of the hard and soft tissues has been completed and the appropriate prosthetic loading timing has been considered, the impression phase of the implant abutment is carried out. In order to respect the principles of maximum precision of the prostheses, to facilitate laboratory procedures by overcoming the casting problems of the prosthetic models in this type of implantology, the impressions are taken with the help of industrial production transfer copings. The implant analogue is then connected, which faithfully reflects the implant pillar of the monophasic device, also eliminating the possible complication of breaking the model during the development of the impressions. A further overcoming of this limit can be given, if the digital implant library is available, by the execution of the impression with the intraoral scanner method, an advantage that would also result in the execution of an entire digital flow. Once the model with the analogous implant pillar has been developed, the dental prosthesis (crown, bridge or superstructure) is carried out on it.

Dental Lab Rendering

There are many advantages that analogues are the same of implant abutment.

First of all, even if the base of the abutment is under the gingival margin, there are no problems in the development of the model and in the visibility of the implant borders. Furthermore, with the help of the model gingiva, the emergence profile of the prostheses and the choice of its contour can be easily defined. The second positive response is the positioning of the analog, which makes the position of the implant on the operating model stable and precise thanks to the coupling guaranteed by the use of plastic impression caps. Add to these the fact that the scan of the analog is facilitated and dimensionally the same so that the realization of the internal and cervical part of the prosthetic restorations is really precise. In some situations, a friction crown can be created that does not require cementation. After scanning the models with the use of analogues and soft tissues, we move on to a completely digital design that provides for the analysis of the spaces available and the choice of materials. After modeling with the use of 3D software, we proceed with the CAM part. When possible, the use of a Peek substructure and an aesthetic composite coating are envisaged. This solution is optimal given the characteristics of the material. The elastic coefficient similar to that of human bone partially compensates for the Extreme rigidity of this type of implant.

This protocol requires that the clinician does not make any preventive changes to the pillar. In cases of need, the parallelism of the abutments takes place through the templates prepared by the laboratory for the guided modification of the abutments before the insertion of the prostheses. All prosthetic components will be digitized shortly by creating ad hoc libraries, thus allowing a completely digital workflow. The implant-prosthetic rehabilitation phase therefore involves the clinical insertion of the dental prostheses.

The absolute precision allows the overcoming of one of the main limitations attributable to the monophasic technique: to create only cemented prosthesis with the consequent criticalities of removing material residues, especially in mucous - gingival tunnels of more than 2mm. The precision of the prosthetic part allows cementation with very small quantities of material and in the case of single elements also the complete absence of adhesive cement. In some situations the intimate connection between the prosthetic component and the implant abutment, consequently also to the cement space provided in the elaboration of the prostheses, may make it necessary to insert it with the aid of controlled or motorized percussion devices.

Case Report

This case report is an example of the technique.

The use of a one piece implant is illustrated in a single edentulous resolution. In a subsequent publication the method applied to multiple edentulous will be explained.78-years-old female patient [10]. Previous osteoporosis treated with oral bisphosphonates therapy, re-educated smoking, she comes to our attention with the request for rehabilitation of the element 2.5, previously extracted. Flapless implant insertion. One piece implant (VIP - Future implant system) was therefore inserted. After the healing of the soft tissues, four weeks after the operation, the final restoration of the element with a peek - composite crown was carried out.

Discussion

The advantages highlighted in the implementation of the HAPPY SYSTEM method, although aware of the need for further study and further scientific evidence, are considerable and predispose to a highly predictable future development of success. Among these, those evaluated by the authors are:

- Simplification of surgical procedures
- Simplification of prosthetic procedures
- Precision of implant-prosthetic rehabilitation
- No modification of industrial precision
- Better patient comfort (no screwing, no problems related to component cleaning, precision single impression)
- Switch to intraoral scanner and digital prosthesis with scan abutment
- Sustainability of implant-prosthetic rehabilitation
- Time management

Conclusions

Until now, the use of one piece devices has submitted a series of limitations and critical points that have induced implantologists to prefer the management of implant

- Prosthetic rehabilitation cases with the aid of submerged or biphasic devices.

From the biomechanical point of view, the absence of prosthetic components in these implants certainly represents the overcoming of what the engineers call "inaccuracies" typical of two-phase implants associated with a better biomechanical behavior in the distribution of bite stress on the surrounding bone. The technique presented today has the aim of overcoming the critical points highlighted over the years and which have limited its diffusion and at the same time highlighting the advantages that this type of implant has always had since its design. Although there is a need for greater scientific and bibliographic study, long-term statistics and reports, there is also the awareness of having introduced a simple and safe method, sustainable and easily repeatable which gives a sign of contemporaneity to the use of one piece implants capable of being a valid alternative to more traditional implant-prosthetic rehabilitation methods.

Figure: 1 Pre operatory Implant Site

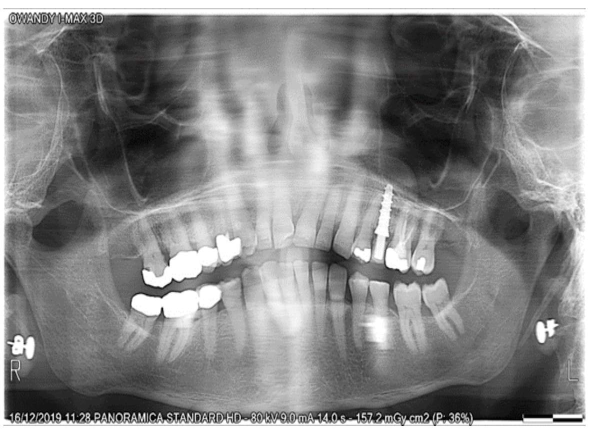

Figure: 1bis opt

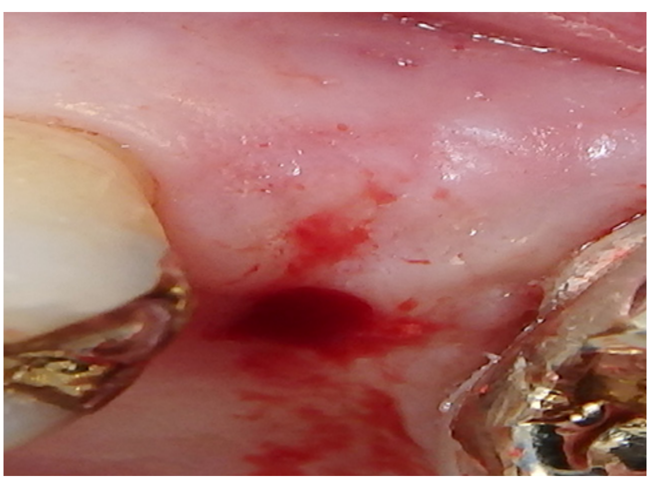

Figure: 2 Flapless Solution

Figure: 3 Implant

Figure: 4 Implant in Site

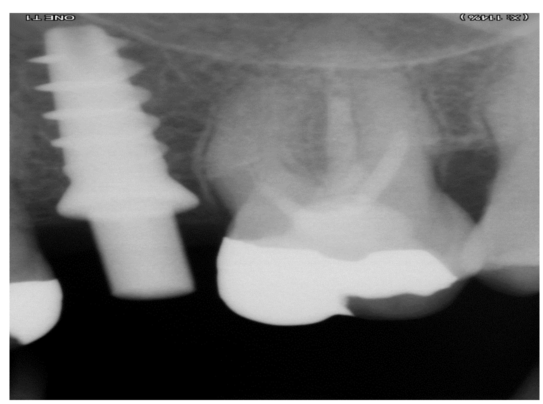

Figure: 4 bis xray

Figure: 5 Implant Cap

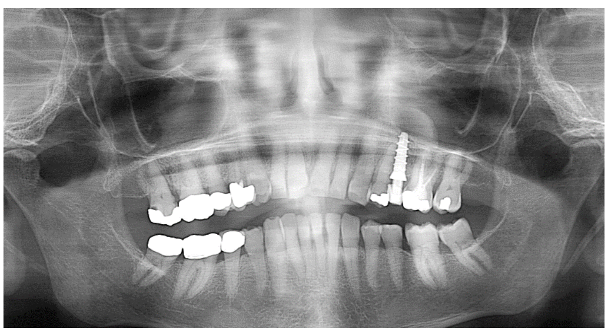

Figure: 5 bis Opt Control

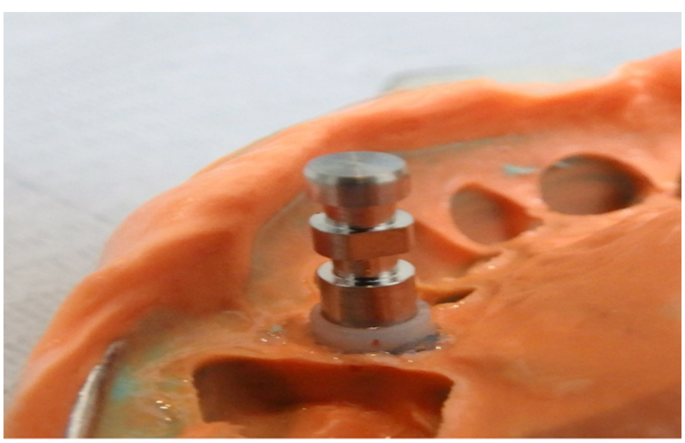

Figure: 6 Impression

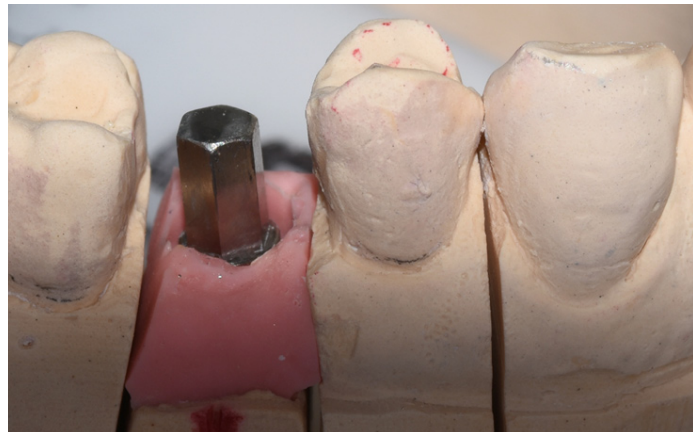

Figure: 7 Implant Model

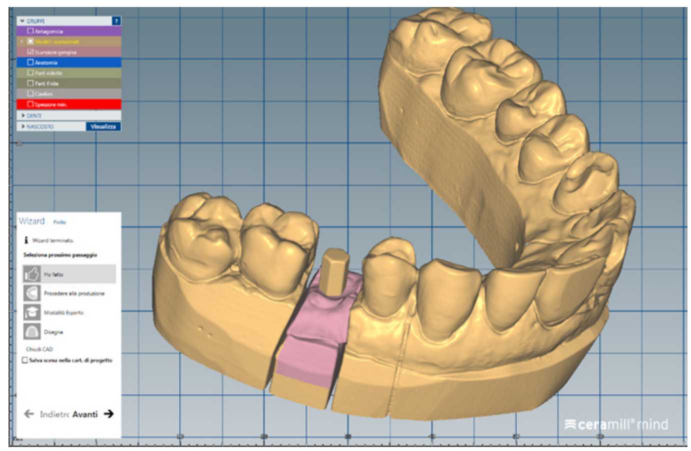

Figure: 7a Digital Lab Crown

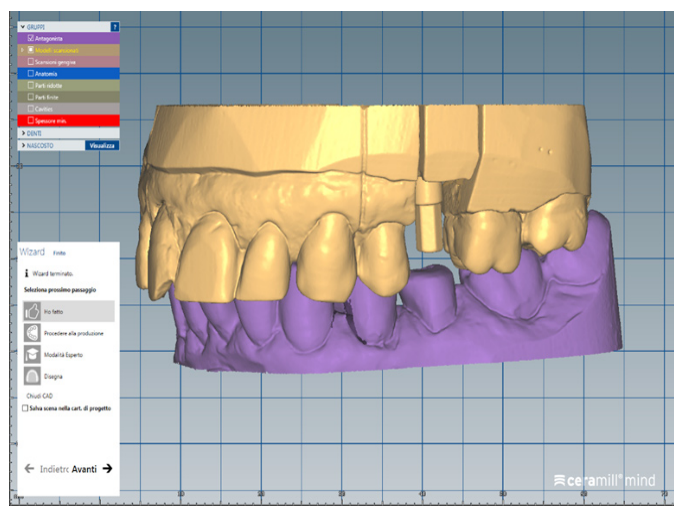

Figure: 7b Digital Lab Crown

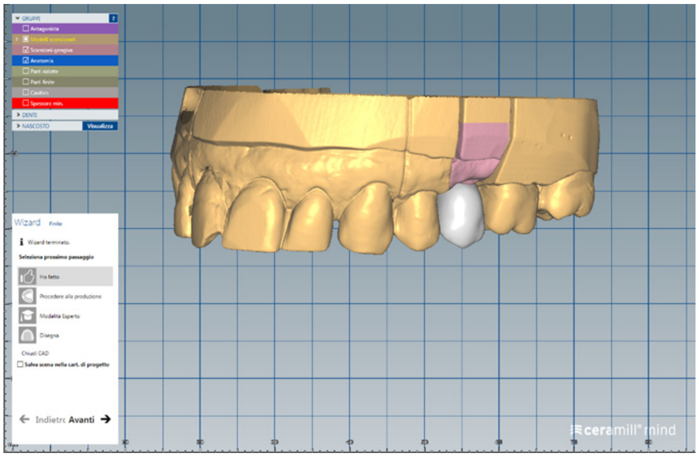

Figure: 7c Digital Lab Crown

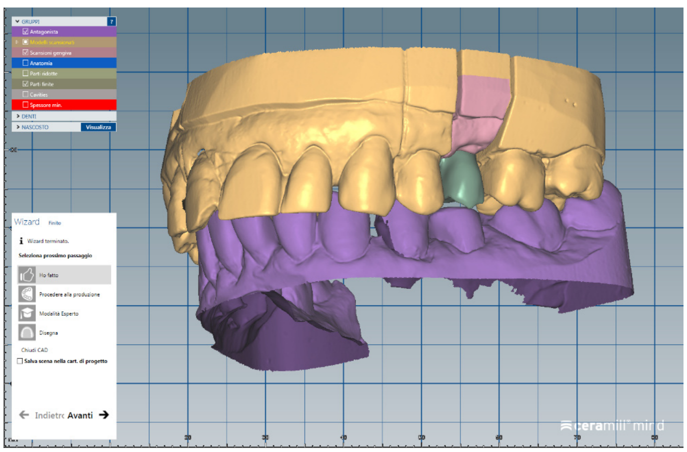

Figure: 7d Digital Lab Crown

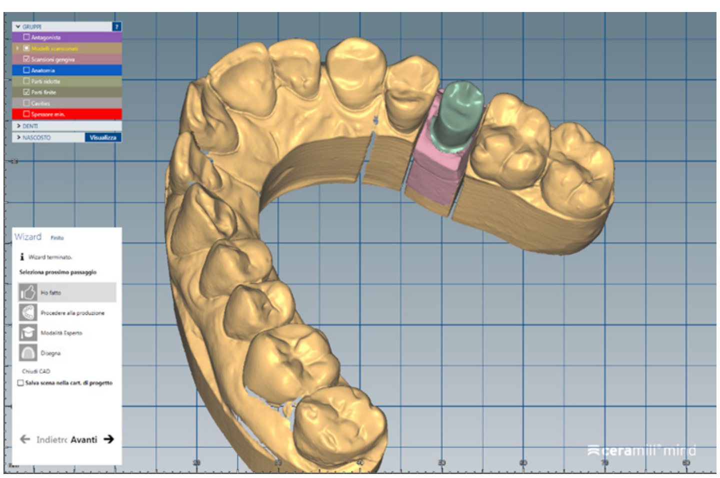

Figure: 7e Digital Lab Crown

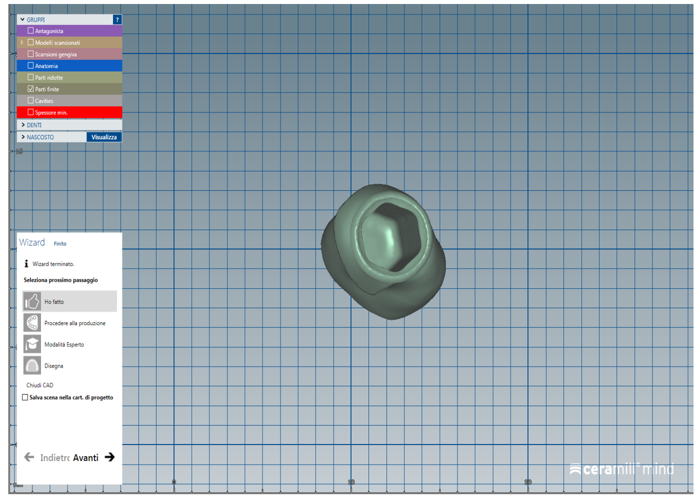

Figure: 7f Digital Lab Crown

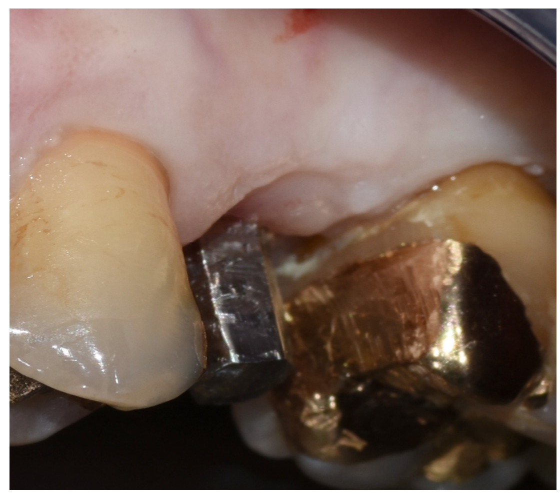

Figure: 8 Tissue Healing

Figure: 9 Dental Crown

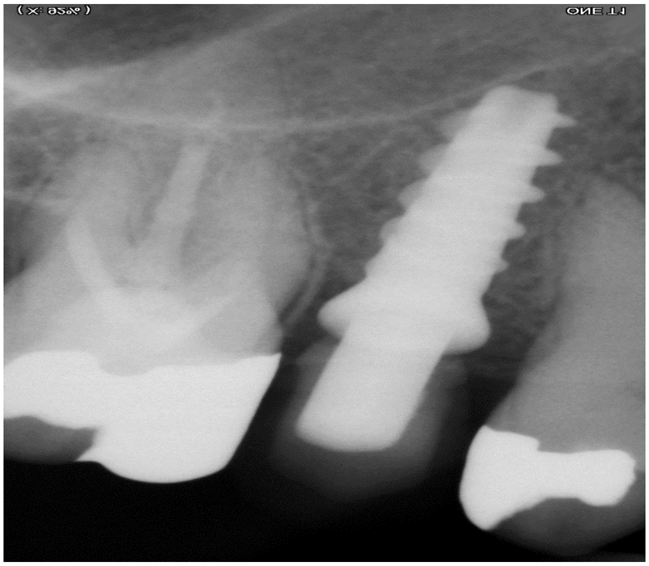

Figure: 10 x-ray control

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